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USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

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USSR REPORT

Machine Tools and Metalworking Equipment

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INDUSTRY PLANNING AND ECONOMICS

PRINCIPAL ECONOMIC TASKS OF 12TH FIVE-YEAR PLAN

Moscow EKONOMICHESKAYA GAZETA in Russian No 18, Apr 86 pp 2, 4

/Article by A. Sukhov, Candidate of Economic Sciences: "Principal Tasks of the 12th Five-Year Plan/

/Text/ In the campaign aimed at implementing the party's economic strategy, a special place is occupied by the 12th Five-Year Plan. To a large degree it is the decisive one of the three five-year plans remaining for our country up to the year 2000. In addition to the well known chief task of the 12th Five-Year Plan, its principal plan is to place the national economy on an accelerated trajectory and to establish a strong foundation for production intensification based upon scientific-technical progress, after having first created the conditions required for subsequent and more rapid movement forward in connection with economic and social development. The current five-year plan must be a turning point in all respects: both from the standpoint of rates of growth and from the standpoint of effectiveness.

A typical characteristic of the 12th Five-Year Plan is an increase in the rates and a considerable increase in the absolute growth in the more important indicators. Thus, compared to the 11th Five-Year Plan when the absolute increase in national income, used for consumption and savings, amounted to 71 billion rubles, during the 12th Five-Year Plan, as called for in the Basic Directions, it must reach 96-111 billion rubles.

In terms of industrial output, the increase will amount to 169-194 billion rubles compared to 135 during the 1981-1985 period, including for Group "A" in industry -- 123-142 billion rubles compared to 99 and for Group "B" -- 46-52 billion rubles compared to 36 billion. Rather considerable increases are planned for agricultural output, retail commodity turnover and for the sales volumes for paid services to the population.

Economic growth must be based upon maximum economies in the use of material and labor resources and improvements in the use of fixed capital and production capabilities, that is, it must be based upon an intensification of social production. And the tasks called for in this regard are extremely impressive.

Thus, in 1990 and compared to 1985, the plans call for the national economy to realize a savings in the use of organic fuel in the amount of 200-230 million tons in a conditional computation, including 75-90 million tons through the development of atomic power engineering and renewable sources of energy; a savings in the use of rolled ferrous metals -- in the amount of 12-14 million tons.

The production costs for output and operations in industry must be lowered by 4-5 percent, in construction -- by 2-3 and in agriculture (sovkhozes) -- by 5-7 percent. This will make it possible within the next 5 years to achieve an increase of 60-65 percent in the requirements for the more important resources. As a result, the savings in material expenditures, for the national economy as a whole, will double in 1990.

The opportunities for economizing in the use of material resources are based mainly upon an increase in the production of progressive types of energy and fuel and the mass use of efficient types of metal products, plastics and other progressive materials. Over the 5 year period, their production will increase by more than a third with growth taking place in the production of traditional materials on the order of only 6 percent.

The most acute and urgent problem is that of raising the quality of the products being produced. In the absence of a radical improvement in quality, the task of solving any large-scale production or social task becomes more complicated. This is associated with an acceleration in scientific-technical progress, since unfinished work by the designers, a deviation from the technology and the use of low-grade materials preclude the possibility of achieving accuracy and reliability in the machines.

The party is attaching a great amount of political meaning to the campaign for quality. This task, it is noted in the Political Report of the CPSU Central Committee, must become a matter of concern for each communist, each Soviet individual and all who respect their work and the honor of their enterprise, branch and our homeland. The Central Committee letter addressed to the party committees, the Soviet and economic organs, professional trade union and komsomol organizations and to all workers requests that a maximum amount of effort be devoted towards improving output quality.

During the five-year period, the proportion of industrial output of the highest category of quality must be increased by a factor of 1.9-2.1, the reliability of equipment operation must be raised and the introduction of all-round quality control systems into operations must be completed for the most part. An acceleration must take place in the review of product standards, with the orientation of these standards based upon high international achievements, and the certification level for industrial products must be raised.

Based upon the chief task of the 12th Five-Year Plan, the plans call for a substantial increase in labor productivity. In conformity with the Basic Directions, the productivity of social labor will increase by 20-23 percent compared to 16.5 percent during the past five-year plan, including by 23-25 percent in industry. For the very first time, the plans call for almost the entire increase in national income, in industrial and agricultural output, in the volume of railroad transport shipments and in construction work to be achieved through increased labor productivity. This is one of the principal features of the new five-year plan and one which is conditioned to a large degree by the demographic situation.

During the 1986-1990 period, the increase in labor resources will decline and amount to only 3.2 million individuals. If labor productivity remains at the

1985 level, then the national economy will require more than 22 million additional workers.

We do not have a shortage of manpower throughout the country as a whole or in a majority of the regions. We are troubled by a low labor productivity level, by insufficiently high labor organization, ineffective stimulation and by the creation of excessive working positions. Some enterprises, design bureaus and research institutes, for the same volume of work, have considerably more workers than similar organizations abroad. In those labor collectives where serious attention is being given to improving labor organization and stimulation, greater discipline and exactingness are being observed, the certification of working positions is taking place and additional opportunities which earlier were not available are now being uncovered. The reserves for raising labor productivity are still considerable and diverse.

Acceleration in Scientific-Technical Progress

An acceleration in scientific-technical progress and the rapid introduction of its results into social production serve as the material foundation for increasing the scales of social production and raising its effectiveness. The task has been assigned of decisively raising the role played by science and engineering in bringing about qualitative changes in the production forces, converting the economy over to all-round intensification and raising the technical level of production.

A requirement of the times is that of decisively adapting science to the production requirements and production -- to science. In actual practice, this signifies a strengthening of those elements which combine science, engineering and production and the creation of the conditions required for rapidly implementing new and progressive developments. Towards this end, the plans called for an expansion in the network of scientific-production associations. Inter-branch scientific-technical complexes for leading trends in scientific-technical progress are being created. Improvements are being carried out in the planning for such progress.

Success in achieving an acceleration is closely associated with a concentration of resources on the more important aspects of scientific-technical progress -- development of electronics, atomic power engineering, complete automation, progressive production technologies and the processing of new materials. During the five-year period, the pool of industrial robots will increase threefold.

During the 12th Five-Year Plan, the use of progressive basic technologies will be expanded by a factor of 1.5-2. New technologies will be employed extensively -- electron ray, plasma, impulse, biological, radiation, membrane, chemical and others, which will make it possible to raise labor productivity repeatedly, increase the effectiveness of use of resources and lower the power and material-intensiveness of production.

The plans also call for the level of automation of production processes to be raised twofold and for the creation of completely automated production operations, which can be reorganized in a rapid and thrifty manner. This

requires a considerable increase in the rates for the renovation of equipment being produced and, by 1990, to raise the proportion of new machines, equipment and instruments being produced to not less than 13 percent of the overall volume of machine building output.

Automation combined with mechanization must radically transform the working positions and make the labor of workers more productive, creative and attractive. Approximately 5,000 automated systems for controlling technological processes will be introduced into industry. Automation is considered to be a most important social task assigned by the party.

During the years of the five-year plan, new generations of computers will be created and mastered -- from super computers to personal ones for school instruction. Extensive electronization of machines and equipment will be carried out in all branches of the national economy. The overall production of computer equipment will increase by a factor of 2.3 during the five-year period.

On the whole, the scale for the mastering of new equipment and technologies during the five-year plan will ensure more than two thirds of the increase in the productivity of social labor and a reduction of 28 billion rubles in industrial production costs.

Changes in Investment Policy

An acceleration in socio-economic development during the modern stage is closely associated with the reorganization of investment policy aimed at activating it. It is directed towards promoting the rapid introduction into production of the latest scientific and engineering achievements and bringing about qualitative changes in the branch's material base and structure. The overall volume of capital investments will increase during the five-year period by 18-22 percent. The absolute growth in capital investments will increase from 125 billion rubles in 1981-1985 to 170 billion rubles during the current five-year plan. Their overall volume will reach almost one trillion rubles. The proportion of resources allocated for modernization and technical re-equipping will increase from 37 percent in 1985 to 40 percent in 1986 and to 50 percent in 1990. Moreover, in those branches and regions of the country where the production apparatus has become especially obsolete, this proportion will be even higher.

The reorganization of investment policy is also expressed in the priority trend for capital investments in machine building, where they are increasing by a factor of 1.8. Investments of resources in the fuel-energy complex are increasing considerably -- by 47 percent. Efficient methods for extracting and processing fuel are undergoing further development. One third of all capital investments is being employed for the agroindustrial complex. In branches which process agricultural raw materials, they will increase by 51 percent.

The resources allocated will be used for accelerating the renovation of the production apparatus and for overcoming the recent trend towards its physical and moral obsolescence. The coefficient of annual removal of obsolete equipment will on the average increase up to 5-6 percent and this will ensure the planned national economic effectiveness. The scales for renovation work

will make it possible to reduce considerably the expenditures for capital repair work.

An organic part of the measures planned for accelerating the socio-economic development of society and raising production efficiency is that of improving the administrative system and the economic mechanism. The goal of the improvements -- to achieve organic unity and effective interaction in planning, economic levers and stimuli and in the organizational structures for administration. This will promote a more decisive conversion over to the use of intensive factors for developing production, accelerating scientific-technical progress and achieving more complete satisfaction of the social requirements. "The situation at the present time is such" reads a comment in the Political Report by the CPSU Central Committee to the 27th party congress, that we cannot be satisfied with partial improvements -- a radical reform is needed."

The existing forms of production relationships and the system of management developed for the most part under conditions of extensive economic development. They have gradually become obsolete and have lost their stimulating role. The decisions handed down during the party congress are aimed at raising the efficiency of economic management and improving planning and economic stimulation.

In conformity with the congress's decisions, the limits for independence by the labor collectives are drawing apart and their responsibility for achieving high final results is increasing. Towards this end, the plans call for enterprises to be converted over to a self-repayment and self-financing basis and for their income to be dependent to a greater degree upon the effectiveness and quality of their work.

Concern for Man

The final goal of the measures aimed at accelerating the socio-economic development of our country is implementation of the party's social policies and concern for man. The plans call for the standard of living of Soviet people to be raised to a new level from the standpoint of quality and for steady improvements to be realized in their living and working conditions.

During the 12th Five-Year Plan, special attention will be given to those problems, the solving of which will to a large degree promote improvements in living and working conditions and an increase in the labor contribution by each individual to the overall task. First of all, the task has been assigned of achieving a reduction in the use of manual low-skill labor. The scales and rates for this reduction will increase by a factor of at least 2-3.

An improvement will take place in the effectiveness of the wage system, which must eliminate elements of wage-levelling and shortcomings in the area of labor standardization and it must increase the stimulating role played by wages.

The question concerning sources for raising rates and official salaries has been posed anew. The resources required for this must be earned by the labor

collectives through production growth, increased production effectiveness, the mobilization of internal reserves and improvements in the organization and standardization of labor.

In conformity with the all-round program for developing the production of consumer goods and the sphere of services, the plans call for the market to be saturated with diverse types of goods for which there is a high demand among the population and also with various types of services.

The social program will also contain measures for improving the availability of housing for the population, municipal economy installations, schools, hospitals and cultural and recreation installations.

Thus the 12th Five-Year Plan must establish a strong foundation for carrying out the party's strategic program for accelerating the country's socio-economic development and achieving a new status for Soviet society from the standpoint of quality.

The 27th CPSU Congress tasked the USSR Council of Ministers with developing, in conformity with the Basic Directions, a draft state plan for the economic and social development of the USSR for the 1986-1990 period, with a distribution of tasks by years of the five-year plan among the USSR ministries and departments, the union republics and the more important economic regions and presenting it for review by the USSR Supreme Soviet in May 1986. A most important economic and political task of all of the party, soviet, trade union, komsomol and economic organizations is that of preparing and organizing in a high quality manner the efficient carrying out of the new five-year plan.

7026
CSO: 1823/203

VORONEZH PLANT UNVEILS NEW 12,500-TF PRESS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 Mar 86 p 4

[Article by V. Zhuravlev, Voronezh: "What the 'Urgent' Message Failed to Mention"]

[Text] Close cooperation among scientists, designers and production workers permits a several-fold reduction in the time involved in manufacturing new units.

When we arrived at the assembly shop, the "Attention! Automatic Line Being Tested" sign had already been taken down, but the workers and engineers who had set up and test-run the line were still there. Production workers were clustered tightly around the developers of the line, a group of specialists headed by automation equipment and hot-stamping department chief V. Kirdun, congratulating them on their creative victor.

The innovation is unusually "hard-working" -- it is capable of meeting in full the demand for "Don-1500" combine cross bars. And it will also save quite a bit of high-alloy steel. Preliminary estimates are that the economic impact will be in excess of 400,000 rubles a year.

The innovation has one other important merit: Voronezh association specialists producing heavy-duty machine presses have succeeded in reducing 2.5-fold the time involved in developing this very complex equipment. How?

First, the nature of interrelationships between association engineers and VUZ and scientific research institute scientists with whom the Voronezh press manufacturers have long cooperated was changed. The scientists are now working, literally, at the same drafting boards as the association's designers. As a result, the time required for economic-agreement work has been sharply cut. But the most important thing is that they managed to radically alter the usual situation in the past, when scientists were little concerned about how, exactly, the association's designers would embody their strategic concepts in metal, or even if it would be done at all. The fact is, they would receive in full the money for conducting the scientific research anyway.

The first sign of change was the concluding of an agreement between the association and scientists at the Moscow Machine Tool Manufacturing Institute, the

All-Union Correspondence Machinebuilding Institute and Voronezh Polytechnical Institute on joint development of a powerful 12,500-tf press.

To put it another way, the end result for the scientists became not a scientific-technical work report, but the creation of an actual machine. I will also add that, with a certificate that the innovation had been introduced in their hands, the scientists would be entitled to a portion of the economic incentives fund. In this regard, the amount depended directly on the size of the economic impact the new equipment would be capable of bringing the national economy.

The composition of the creative forces of the association which participated in this joint development was also changed. Engineer brigades were created which included highly skilled specialists from a very broad range of fields: designers, electronics engineers, hydraulics engineers. This joining of efforts permitted the development of subassemblies which were optimum in the views of all parties concerned.

Workers in the association's reliability department also contributed their bit to saving planning time. Whereas they had previously done the bench testing on finished units and had revealed design shortcomings in stages, this time they "ran" the individual machine subassemblies on the test benches as the experimental sector manufactured them. "Weak" spots in the future unit discovered this way were "strengthened" by the developers while still in the design stage.

The results of this "brainstorming" by production workers and scientists did not take long to show up. The technical level of this huge press turned out to be a step higher than that of previous developments by Voronezh press builders. And the press was designed 1.5-times faster.

"And even this kind of design acceleration is not the limit," vow the press builders, after developing one model of this "hercules" is five months instead of the year and a half it invariably took them the old way.

Incidentally, design schedules at the association will be compressed even more in the near future. The fact is, the first line of an automated design system is going on-stream at this production association for heavy-duty mechanical pressed. The worktables of the association's leading designers will have display terminals they will be able to use for direct contact with an "electronic brain."

...Leaving the enterprise, I caught sight of an "urgent message" in a passageway: "Congratulations to the creative hot-stamping press department collective headed by communist V. Gorozhankin for meeting higher socialist obligations in honor of the 27th Party Congress by quickly developing the design for an automatic piston stamping line for the Gorkiy Automotive Plant!"

The automatic line referred to in the "urgent message" is based on a metal-saving technology. This microprocessor-controlled innovation has no analogs as yet. The economic impact will be about half a million rubles a year.

11052
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INDUSTRY PLANNING AND ECONOMICS

SHATURA LASER R&D FACILITY ESTABLISHED

Moscow LENINSKOYE ZNAMYA in Russian 22 Feb 86 p 1

[Excerpt] A scientific experimental and production-technological facility of the USSR Academy of Sciences' Scientific Research Center for Technological Lasers (NITS TL) was formally opened yesterday in Shatura.*

It was good to arrive on the eve of this event.

Such visits by journalists are burdensome for their hosts, of course. But neither Galym Abil'siitovich Abil'siitov, director of the center, nor Valeriy Andreyevich Ul'yanov, scientific secretary of NITS TL, reproached me in any way for keeping people from their work.

On a stand, a multichannel laser was hardening valves for engines of the "Automotive Plant imeni Likhachev" association. As a result of this operation, the wear resistance of valves is heightened by several times. The center has been collaborating with the automotive plant for more years than one.

In a laboratory, I was shown still another development: a miniature robot, small enough to fit on a desk, was holding a needed part in its arm. The proper sections of this part are placed under a laser beam by the robot, with filigree-work precision. A mathematical program for the computer which controls this robot was being tried out.

Ye. P. Velikhov, vice-president of the USSR Academy of Sciences, attended the opening of the center.

NITS TL is the chief organization of an inter-agency scientific-technical complex on technological lasers. It not only develops technological lasers and puts them into series production but also coordinates the efforts of many industries aimed at developing a component base for laser technology, develops and produces test prototypes of this technology, and does exploratory work.

At the center, they are also thinking about the future, which at present is pictured as follows: a third phase of the center will be completed and a scientific residential community will be built, in which associates and guests of the center will be housed.

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INDUSTRY PLANNING AND ECONOMICS

EDITORIAL URGES IMPROVED EFFICIENCY IN LITHUANIAN MACHINE BUILDING

Vilnius SOVETSKAYA LITVA in Russian 18 Mar 86 p 1

[Article: "Technical Progress -- Command of the Times"]

[Text] The effectiveness of our renovation of the national economy and the rates of economic growth will depend decisively on machinebuilding. That is precisely where the fundamental scientific and technical concepts are materialized, where new tools and machine systems which will determine progress in other branches of the national economy are created. This lays the foundation for a broad outlet to fundamentally new resources-conserving technologies, higher labor productivity and improved product quality. "The CPSU has enormous experience in implementing very large scientific-technical and socioeconomic transformations," states the Political Report of the CPSU Central Committee to the 27th Party Congress, "but no matter how important they have been, our work in the past cannot compare in scope or complexity with what needs to be done in the period ahead to renovate the national economy."

The collectives of the leading machinebuilding and machine tool manufacturing enterprises of the republic are directing their efforts at accelerating the creation of new equipment and techniques. To this end, steps are being taken to retool and renovate the enterprises themselves. In particular, we are accelerating the rates of introduction of flexible manufacturing systems, as well as industrial robots, NC equipment, automated and mechanized flow lines, and automated design and control systems. We are set the task of sharply increasing production of special technological equipment to meet in-house needs. A number of enterprises intend to introduce progressive technological processes based on new types of plasma and laser technology, on low-waste and waste-free technologies. And republic machinebuilding and machine tool manufacturing enterprises have accumulated some experience in this area. We have begun operating a flexible automated production facility at the Zhalgiris machine tool manufacturing plant in Vilnius, manufacturing centers at the Kaunas Machine Tool Manufacturing Association imeni F. E. Dzerzhinskiy, and so on.

At the same time, there are quite a few shortcomings in this area. Current rates of development of individual machinebuilding and machine tool manufacturing enterprises are inadequate. Thus, the Vilnius Machine Tool Manufacturing Plant imeni 40th Anniversary of October and the Neris and Elfa production associations failed to reach the control figures of the 11th Five-Year Plan assignments. There is serious concern that machinebuilding enterprises have

thus far been able to make full use of only half the automated and mechanized flow lines, that a significant part of the latest equipment it being operated for only one shift, that the schedules for bringing new facilities up to full capacity are not being met at nearly half the projects.

We need to eliminate these and other shortcomings quickly. As was noted at the 19th Congress of the Lithuanian Communist Party, we need to radically alter the approach of individual economic leaders here to accelerating scientific and technical progress. The party gorkoms, raykoms and primary organizations need to monitor these questions more closely, and the monitoring must be constant and demanding. Success in this most important area will depend largely on the high principles, initiative and aggressiveness of the party organizations.

Much needs to be done. Republic machinebuilding and machine tool manufacturing enterprises and associations and corresponding scientific research institutes and organizations have been set important tasks in the 12th Five-Year Plan. The Sigma, Elfa, imeni F. E. Dzerzhinskiy, Vilnius Fuel Equipment Plant imeni 50th Anniversary of the USSR, Vilniuselektrosvar, Vilnius Construction Finishing Machinery Plant, Kapusk Automatic Food Equipment Production Association imeni 50th Anniversary of the USSR and other enterprises and organizations must ensure an abrupt improvement in the technical level, quality and competitiveness of machinebuilding output, changing over to the production of new generations of machinery, equipment and instruments whose productivity and reliability will be 1.5- to two-fold higher than that of output now in production. Machine tool manufacturing enterprises are faced with increasing their production of machining centers, electronically-controlled plate-measuring engines, and machine tools with numerical programmed control [NC] nearly three-fold.

Each communist and every enterprise and association worker in machinebuilding, machine tool manufacturing, and corresponding scientific institutions and planning-design organizations must be clearly conscious of the fact that success in implementing the plans outlined in the 12th Five-Year Plan will depend on their labor, on their attitude toward their jobs, on their efforts. No matter where a communist works, he is obligated to remember that accelerating scientific and technical progress and changing the economy over to a modern channel is a vital cause for him. Each party member, armed with the resolutions of the 27th CPSU Congress, must take his place in the front ranks in this genuinely nationwide struggle and set a personal example to others by fighting against routine and mismanagement, against thoughtless scattering of the people's funds, against localistic, bureaucratic egoism. The question today is: do you want to improve the material condition of the collective and your own, to deserve people's respect, to boldly update technology and production, conserve resources, and learn to keep up with life and to move forward quickly?

11052
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INDUSTRY PLANNING AND ECONOMICS

ASSOCIATION DIRECTOR DISCUSSES QUALITY IMPROVEMENT

Moscow EKONOMICHESKAYA GAZETA in Russian No 13, Mar 86 p 9

[Article by V.G. Skachkov, general director of the Gorky Machine-Building Association: "Although Demand Has Not Fallen"]

[Text] Are you satisfied with the quality of products? What is needed to improve their consumer qualities? We turned to the directors of a series of establishments for answers to these questions and we have published their answers below along with the comments of our correspondents.

In the CPSU Central Committee's Political Report to the 27th Party Congress, much emphasis was placed on product quality. This is a factor that has a direct influence on scientific and technical progress, consumer demand and the resolution of important social, economic and practical issues. In the final count, it is the conscientiousness and skill of workers and the engineering and scientific ability of specialists that determine the quality of production, the honor of work crews and factories and the prestige of our country.

The problems involved in improving product quality are considered in the following remarks by our correspondents and the directors of a series of establishments.

The production of the machine-tools factory and now that of the association too is exported to 70 countries including many highly-developed ones. Just as before, our machine-tool production is demanded so finding buyers is no problem. Today, for example, we have to produce 6400 machine tools and various design and this greatly exceeds the planned production of past years.

However, the presence of consumers, that is, of a market, by no means attests to our full well-being and is no cause for complacency. The manufacturer of any type of equipment must always remember how well his product can compete on the market against better domestic and foreign models. Competition and technological progress are constant phenomena and to avoid falling behind, it is necessary to constantly improve everything that you make.

It must be admitted that our industry has failed to properly consider this problem until only recently. Manufacturers thought: "They have bought our machine tools and are asking for more -- there's nothing to worry about, we can just increase our output using the same technology." Therefore, "R" series machinery has been produced for decades now without undergoing any serious modifications.

Noticeable positive changes were made after the April 1985 CPSU Central Committee plenary conference on technological progress. To replace the old "R" series, it was decided to manufacture "T" series console all-purpose milling machines that are more 150 percent productive than their forerunners. The state seal of quality was awarded to 8 models of this series and three others. Therefore, the portion of higher-category production reached 92 percent of the certified production.

Last year, we decided to reconstruct our association: we organized new production lines, renewed some of our basic funds and created a large amount of needed equipment and attachments. The re-equipment of our shops is continuing but unfortunately, we still have not managed to coordinate our association's future plans with the ministry or its planning organs.

In the opinion of the association's directors, we must specialize in the production of multi-operation "OTs" numerical control machine tools. In 1985, we produced and sold 250 of these and by the end of the 12th 5-year period, we could produce 6 times that number. There is an enormous demand for them because they sharply increase labor productivity. Naturally, if we are to solve this problem, we will have to turn over the production of our all-purpose machine tools to some other factory.

Both the quality of our machine tools and the amount that we produce depends to a considerable degree on the activity of our partners. Is it normal that Minpribor's plants last year provided us with only 74 percent of the planned supply of numerical control equipment? To put it simply, the quality of what they did provide us often left much to be desired. An how well are the Ministry of Automated Industry's Kursk, Vologda and Moscow bearings factories meeting their responsibilities? At most, they have sent 85 percent of what we ordered and we often found defects in what we did receive.

We do of course have our own faults against which decisive action must be taken by the association directors and social organizations. If defects are not eliminated, replacement claims follow. It is therefore quite obvious that we have to take a critical attitude toward our own successes.

12261
CSO: 1823/171

INDUSTRY PLANNING AND ECONOMICS

MACHINE TOOL INDUSTRY SHORTCOMINGS SCORED

Moscow PRAVDA in Russian 14 Apr 86 p 2

/Article by V. Gerasimov, Leningrad: "Rush Work At the End of the Month" and commentary by USSR Minister of the Machine Tool and Tool Building Industry B.V. Balmont/

/Text/ A lack of rhythm -- a chronic disease at the Leningrad Machine-Tool Association imeni Sverdlov. More than 70 percent of the machine tools produced are presented to the Technical Control Department and shipped to the customer during the last week of the month. Ten days prior to the end of March, when we met with the association's general director B. Taller, only nine of the 49 machine tools called for in the program had been produced.

In particular, two assembly departments had fallen behind. Here they had begun producing more modern units of equipment instead of the traditional ones used by an enterprise. This included multiple-position flexible production modules and highly accurate machine tools with programmed control. These are very necessary items which are eagerly being awaited by the customers. But of 13 such machine tools, not one had been assigned a passport bearing the stamp of the OTK /Department of Technical Control/. With regard to the four modules, it was during the preparation of the monthly program that they were "postponed" until the last week.

"The conversion over to new machine tools is proving to be difficult" commented the general director, "We have complaints against the suppliers and yet this does not constitute the chief cause of the lack of rhythm. We have not allowed the designers sufficient time for planning and we were not able to prepare the production operations in the manner required."

The mistakes of the designers are making themselves known -- changes and corrections to the drawings submitted to the departments are being noted every day and this inevitably requires alterations in the equipment and corrections to the technology. And time is passing! Another factor is also playing a role: the sector for the processing of basic parts is not coping with its workload. Why is this? Here the equipment is quite worn out and in addition there is not enough of it.

A lack of responsibility on the part of some suppliers is also hindering the work. For example, quite often there are problems in the assortment of metals.

Thus the Orsk-Khalilovo Metallurgical Combine failed to supply 49 tons of the rolled metal needed, but in return supplied 18 tons of a type that was not required. An increase has taken place in the work being performed by the blacksmiths and machine tool builders and for no reason metal is being turned into shavings.

Commentary By the Minister

> As reported by the USSR TsSU /Central Statistical Administration/, a number of other enterprises of Minstankoprom /Ministry of the Machine Tool and Tool Building Industry/ are also suffering from a lack of rhythm. Thus the Chimkent Association for the production of forging and pressing equipment produced 70 percent of its machines during the last work week of February and the Tbilisi Machine Tool Association -- 81 percent of its metal-cutting machines.
>
> What measures are being undertaken aimed at eliminating these problems and improving the rhythm? This was the question which PRAVDA correspondent N. Lyaporov addressed to the Minister of the Machine Tool and Tool Making Industry for the USSR B.V. Balmont.

During a visit to the Kuybyshev Plant for Coordinate-Boring Machine Tools, the General Secretary of the CPSU Central Committee M.S. Gorbachev noted that one urgent task of the machine tool builders is that of raising the production rates and the quality of output and achieving rhythm and strict observance of delivery discipline.

At the present time, both within the branch and in all areas, order and discipline are becoming stronger and greater concern is being shown for placing new reserves in operation in a more rapid manner. This is being promoted by the conversion of the branch over to the new administrative structure on 1 January. The all-union industrial associations have been abolished, less reliance is being placed upon petty support and greater efficiency is being displayed. The enterprise leaders are aware that someone must answer for poor work carried out during a particular week. Usually, such responsibility surfaces during a meeting of the board. Such was the case, for example, with the Novosibirsk Tyazhstankogidropress Association. The collective had lagged behind for a long period of time. The board listened to the leaders. Experienced specialists visited the site, studied the situation and furnished assistance. The work improved: by March the association had caught up and fulfilled its plan.

The situation at the Leningrad Machine Tool Plant imeni Sverdlov is also being corrected. At the Tbilisi Machine Tool Plant, the situation is somewhat more complicated. Even during the past five-year plan, the enterprise was tasked with developing new modern machine tools, but the leaders failed to display initiative and responsibility and although a great amount of time has passed there is still no new equipment to show for it. Together with the republic's party organs, more strict demands must be placed upon the general director, communist G. Dzhikidze: why is it that the association is making poor use of the experience accumulated in reducing the periods for the mastering of new products?

Today a great deal is dependent upon the enterprises and their collectives, more than was the case in the past. Indeed their rights have been expanded and thus the demands being placed upon them must be increased accordingly. Here we believe it is especially important to organize close interaction between the economic leaders and the primary party organizations and between the branch staff and the local party organs. For example, together with the capital's communists, we willingly supported the initiative of the Moscow Stankostroitelnyy Zavod Association imeni S. Ordzhonikidze, where a competition was launched under the slogan "For each working day -- efficient work rhythm and high quality." The development of this undertaking on a branch level will release the collectives from having to solve many operational problems.

The experience of Kiev and Lipetsk machine tool builders is rather instructive: here, councils of brigade leaders have actively joined in the work of improving the rhythm and quality of work. Equally important is the need for strengthening public control over the correct use of incentive measures. In particular, skilful use is not being made in all areas of such a stimulus as an increase (up to 20 percent) in the bonuses paid out for rhythmic work during the initial weeks of a month.

One of our large sub-branches is that concerned with the production of forging and pressing equipment. Here not only the Chimkent workers, who were mentioned in the report by the USSR TsSU, but also a number of other collectives are lagging behind. Specialists have studied the reasons for this falling behind. One of them is weak equipping for production operations. Renovation work will be carried out. In the meantime, the backward elements will receive assistance from plants of other sub-branches in the production of the deficit units and parts and in training skilled machine tool builders.

The conversion over to the new administrative structure is expanding our potential for reorganizing management and for exercising greater control over weak elements. For example, several new production and scientific-production associations, with some backward plants included in them, have been created. As a result of having received technical and personnel support from leading plants under the new conditions, they have improved their work noticeably. Thus the work rhythm was poor and tasks were often disrupted at the Kostroma plant for automatic lines. But during the first quarter, being now attached to the Moscow Stankoagregat Association, it improved its operations and gathered speed. The same holds true for the Sasovo Machine Tool Plant, which is now subordinate to the Ryazan Machine Tool Association.

The so-called production regulation system in the branch, the purpose of which is strict observance of the schedules for the production and shipment of equipment to customers (we refer to it briefly as a "production-delivery" system), is proving to be of considerable assistance. The system's value lies in the operational solving of problems by the ministry's subunits. As yet, only the equipment for important national economic underway products is under the control of this system. But the task has been assigned of steadily extending its stern requirements even farther -- to cover all products. An improvement is taking place in the coordination of actions with related ministries in connection with achieving rhythmic operations, a high technical level, quality and product reliability.

All of this made it possible to fulfill the branch's plan for the 1st quarter by 103 percent and to achieve an increase in output of 10.7 percent compared to the same period for 1985. All 19 items of the principal nomenclature, taken into account in particular by the USSR TsSU, were fulfilled. One fourth of all output called for in the annual plan was produced during the 1st quarter of the year.

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INDUSTRY PLANNING AND ECONOMICS

INTEGRATED DEVELOPMENT OF TOOL PRODUCTION

Kiev TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 1, Jan 86 pp 4-6

[Article by Candidate of Engineering Sciences V. I. Vitushkin and Engineers I. M. Gutman, Zh. P. Moiseyeva and Ye. D. Pavlov]

[Abstract] The integrated plan for the development of tool production in the heavy and transportation machine building branch for 1986-1990 is discussed. The integrated plan was prepared by analyzing the status of the tool production of associations and enterprises within the branch, as well as the suggestions of branch design and technological institutes, all-union industrial associations, and a number of functional administrations of the Ministry of Heavy Machine Building. The main task under the integrated plan is to increase capacities and expand the production of fundamentally new technological tools and equipment in order to create the conditions for continued automation and mechanization of basic production. The directions to be taken in the development of tool production under the integrated plan are outlined. The main source for increasing capacities is seen as technical reequipping of tool production. Plans call for creating 11 specialized sections to produce high output tools and universal accessories for branch-wide use. The measures provided for in the integrated plan will make it possible to increase labor productivity by 10-15 percent in basic production processes, and to improve other technical and economic indicators of branch enterprises.

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INDUSTRY PLANNING AND ECONOMICS

MODERNIZATION OF OIL DRILLING EQUIPMENT PRODUCTION NOTED

Moscow NEFTYANIK in Russian No 3, Mar 86 p 9

[Article by V. K. Melnichuk, director of the Ukrgiproniineft: "20th Anniversary on the Threshold of the New Five-Year Plan"]

[Text] The State Scientific Research and Planning Institute of Petroleum Industry of the Ukraine (Ukrgiproniineft) was created in April 1966 by decision of the USSR State Committee for Science and Technology and was called upon to provide scientific developments and estimate-planning documentation for the petroleum industry in southwestern regions of the USSR.

Over its 20 years of operation, the institute has grown into a major scientific center. Just during the last two five-year plans, 360 institute developments with an economic impact of more than 70 million rubles have been put into production; 145 works were protected by author's certificates, and the best of these were awarded 56 VDNKh (All-Union Exhibit of National Economic Achievements] medals and certificates. Such developments as drilling mud agents, rust inhibitors, mud pump rod packing, and others have found extensive application in the branch.

The institute has developed 43 types of normative-technical documentation, including two branch standards, 12 guidelines and 29 enterprise standards.

In the 11th Five-Year Plan, development of the second SAPR [automated design system] line for the planning institute was finished. It has been accepted for commercial operation by a departmental commission. Introduction of programmed equipment has permitted automation of 27 percent of the planning work and a 20-percent increase in labor productivity.

Last year, the amount of planning-prospecting work reached 4.0 million rubles. The institute is now doing planning work for practically every petroleum extraction region of the country.

This is the lead branch institute for planning civil and housing construction, mechanical repair and machinebuilding plants, for construction industrialization and its own production base (plants producing building and specialized materials); it also provides capital construction information.

Major institute construction, expansion, renovation and retooling projects have included the "Nefteburmashremont" plant in Kaluga, the seismic equipment special design bureau in Gomel, the Leninogorsk automation equipment plant, the Nizhnevartovsk automotive repair plant, the "Neftemashremont" pilot plant of the "Azerneftemashremont" production association in Krasnodar, and others.

Institute plans have been used in construction of the ministry's conference hall and board hall, the "Belorusneft" association guest house, the administrative buildings of the "Ukrneft" (Kiev) and "Belorusneft" (Gomel) production associations, "Megionneft" (Megion) and "Uryevneft" (Langepas) NGDU [petroleum and gas extraction administrations], the 1200-seat Palace of Culture for petroleum workers in Almetyevsk (a design awarded an RSFSR Gosstroy Certificate), the Pioneer camp in Anap for the "Komineft" association, and others.

The institute has done considerable work in Western Siberia, especially in the area of planning various production centers and oilfield public amenities. Suffice it to say that a third of the planning-prospecting work done in this region has been done for the Glavtyumenneftegaz.

Scientific-technical cooperation between the Ukrgiproniineft and organizations of the USSR Academy of Sciences, Ukrainian SSR, Belorussian SSR and Ministry of Higher and Secondary Specialized Education has expanded and increased. Thus, it has cooperated with the Welding Institute imeni Academician Ye. O. Paton of the Ukrainian SSR Academy of Sciences and the Belorussian Academy of Sciences' Nuclear Physics Institute in developing the technology for and will produce the prototypes of insulated pipe with corrugated inserts to increase crude production by pumping in water with high thermodynamic parameters.

It is planning, with other Ukrainian Academy of Sciences institutes and organizations of a number of ministries and departments, to set up the industrial production of new types of lubricant additives for drilling muds, a low freezepoint rust inhibitor, and a powdered rust convertor.

Institute ties with CEMA member-nation and developing country organizations and specialists are being developed and strengthened.

Work is continuing on drawing up technological flow charts and development plans for petroleum deposits at Varadero and Boca de Haruco in Cuba, a drilling base and housing settlement in Iraq, for flooding a petroleum deposit in Syria, and so on.

Twenty years is not long in the life of an institute, but it is adequate to affirm that our close-knit creative collective is capable of producing scientific developments and estimate-planning documentation of high quality based on the latest scientific and technical achievements.

11052
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INDUSTRY PLANNING AND ECONOMICS

BULGARIAN DELEGATE TO 27TH CPSU CONGRESS INTERVIEWED

Moscow EKONOMICHESKAYA GAZETA in Russian No 14, Mar 86

[Interview with Grisha Filipov, member of the Bulgarian Communist Party Central Committee Politburo and secretary of the Bulgarian Communist Party Central Committee: "Ambitious Prospects of True Socialism"; date and place not specified]

[Excerpts] A delegation from the Bulgarian Communist Party headed by Bulgarian Communist Party Central Committee General Secretary and State Council Chairman of the NRB [People's Republic of Bulgaria] Todor Zhivkov participated in the work of the 27th CPSU Congress. Our correspondent interviewed Comrade Grishi Filipov, a member of the Bulgarian Communist Party delegation, and we publish that interview below.

[Question] What is your opinion about the development of political, economic and scientific-technical cooperation among countries of the socialist community at the present stage?

[Answer] The role of further strengthening the unity and deepening the fraternal cooperation of countries of the socialist community in ensuring social progress and peace on earth is especially great.

The collective policy of further deepening socialist economic integration by developing scientific-technical and production cooperation, direct ties among scientific and economic organizations and enterprises, as well as by creating joint organizations, enterprises and companies, is an important factor in actualizing our plans. This will significantly broaden the sphere of vital intercourse of citizens of the socialist countries, of people in various occupations and of various generations, which will be an additional source of mutual spiritual enrichment, a conduit for exchanging ideas on and experience in developing socialism.

[Question] How do you evaluate the prospects for Soviet-Bulgarian cooperation at the level of implementing the Comprehensive Program of CEMA Member-Nation Scientific-Technical Progress and bilateral agreements?

[Answer] We are convinced the prospects are most optimistic. What allows us to think this?

Let me begin with the fact that the Comprehensive Program of Scientific-Technical Progress (KP NTP) for CEMA Member-Nations marks a transition to a qualitatively new stage in cooperation among the fraternal nations of socialism. This stage is making qualitatively new and higher demands on all further development and deepening of our interaction. What are those demands?

Foremost, the necessity of concentrating forces and resources on the priority directions of scientific-technical progress in order to intensify all branches of material production.

Second, the cooperation programs now comprehensively encompass the whole "science - equipment - production - marketing" cycle, which will enable us to overcome the gap which has heretofore existed between scientific-technical and production cooperation.

Third, the KP NTP formulates in a new way the requirements to be made of the scientific-technical level and quality of developments and the resultant products to be supplied on a reciprocal basis.

Thus, implementation of the Comprehensive Program will be a powerful level for elevating the economy of all countries of the socialist community to a qualitatively new level. I must say directly that, without cooperation and consolidation with other fraternal countries, and especially with the most scientifically and economically developed socialist power, the Soviet Union, this would simply not be within the abilities of a small country like ours.

The leading role of the Soviet Union, with its world-leading scientific and technical potential, in implementing the KP NTP is generally known and acknowledged by all. Quite naturally, it will be the Soviet scientific and technical centers which will, with the common consent of all CEMA member-nations, be the lead coordinating organizations for an overwhelming majority of the problems in the Comprehensive Program.

[Question] The Bulgarian Communist Party is approaching its own next Congress, the 13th. Tell us, please, about the preparations for it, about the tasks to be put forward in the economic area.

[Answer] Preparations for the 13th Bulgarian Communist Party Congress, which will be convened in early April, have entered the concluding stage.

It is anticipated that national income will have been increased by 22-25 percent by 1990 and that capital investments and manufacturing output will be 25-30 percent higher than in 1985. Agricultural output must be increased by 6-8 percent in 1986-1990 as compared with the preceding five-year plan.

We anticipate accelerated product updating and an increased share of new and improved items to conform to the demands of the national economy and the international market.

Particular attention will be paid to deepening international specialization and consolidation, to developing direct production ties, to creating joint enterprises (foremost in machinebuilding) with the USSR and other CEMA member-nations, to changing over decisively to new and higher forms of cooperation organization and rapprochement with the USSR in the areas of science, production and other areas of public life.

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INDUSTRY PLANNING AND ECONOMICS

BRIEFS

NEW AUTOMATED FACTORY—A new automated complex for the production of parquet panels has been manufactured at the Petrozavodsk Machine-Tools Factory. The entire technological process from the manufacture and assembly of separate parts to the final finishing of the panels is carried out by three lines. The complex can turn out 200,000 square meters of panelling per year and is operated by a crew of 10. [Text] [Minsk NARODNOYE KHOZYAYSTVO BELORUSII in Russian No 2, Feb 86 p 2] 12261

NEW SCIENCE INSTITUTE--In Ufa, there has appeared a beautiful new building with spacious laboratories and experimental facilities. Its owner is the recently-established Institute of Metal Superductility of the USSR Academy of Sciences. The new institute will have the important task of accelerating scientific and technical progress in machine building and of thoroughly adjusting the technology used in this industry. [Text] [Minsk NARODNOYE KHOZYAYSTVO BELORUSII in Russian No 2, Feb 86 p 2] 12261

REDUCED METAL CONTENT IN MACHINE TOOLS--Vilnyus. The staff of the Vilnyus Komunaras Machine-Building Factory has mastered the series-manufacture of improved NC metal-cutting aggregates. The first lot of this equipment was sent today to machine-building factories in Moscow and the Ukraine. The metal content of these machines has been substantially reduced. Specialists at the Vilnyus branch of the Experimental Scientific Research Institute of Machine Building [ENIIMS] suggested that cast-iron parts be replaced with welded structures. Furthermore, waste-free stamping was introduced to replace the cutting of parts from steel sheets. "The weight of the factory's production was reduced through the successful realization of a comprehensive program to conserve metal that was carried out by the Lithuanian Republic's machine-building industry," said the deputy chairman of the Lithuanian SSR Gosplan, A. Jovarauskas. "On the recommendation of specialists at ENIIMS, all of the industry's plants now have experimental sections and research laboratories working on the problem of reducing metal consumption. Cooperation with scientists has made itself felt in various areas of the economy. For example, the first aggregates with foundations made of plastoconcrete and granite have already been produced. Many plants at which this new item is to be produced are now being re-equipped at a faster pace." [Text] [Yerevan KOMMUNIST in Russian 28 Mar 86 p 1] 12261

CSO: 1823/171

OTHER METALWORKING EQUIPMENT

PLASMA SPRAYING UNIT INSTALLED AT MINSK GEAR PLANT

Minsk NARODNOYE KHOZYAYSTVO BELORUSSII in Russian No 2, Feb 86 p 26

[Article by A. Potapov, gear plant tool department chief, S. Kadnikov, senior scientific associate at the Belorussian SSR Academy of Sciences' FTI (Physicotechnical Institute) and candidate of technical sciences, and V. Tarasevich, NARODNOYE KHOZYAYSTVO BELORUSSII correspondent: "Plasma-Hardened Tools"]

[Text] Many scientists at the Physicotechnical Institute of the Belorussian SSR Academy of Sciences have been issued permanent passes to the Minsk Gear Plant. They are here not as guests, but as helpers, as reliable, prestigious partners. With their help, progressive technologies are being mastered and new equipment is being introduced. We discuss today one such innovation, the use of plasma spraying to increase the durability of forge-stamp tools and accessories.

First, let us explain why scientists have chosen the MZSh [Minsk Gear Plant] to develop their innovations in a factory setting. The fact is, the very character of its production offers broad opportunities for verifying the correctness of a particular concept born in the laboratory. Strict enterprise specialization, increased machining precision requirements for gear teeth, mass production -- all this creates good conditions for strength-testing new technologies. Characteristically, it was associates at the strength laboratory itself who initiated the cooperation between the scientists and the production workers.

At that time, plasma hardening had just begun to be used in industry. There were many unclear aspects, but there was also no doubt about the advantages of the new method. As compared with others such as electroplating, flame-spraying or detonation coating, it permitted ease both of forming the protective layer and restoring the thickness lost in the course of use to within 1.5 mm.

Now, when you watch machine operator Ilya Mikhaylovich Lin work and you see how quickly the number of finished mandrels on the shelving increases, you don't think about how much trouble introducing this technology caused. The reference is not only to choosing optimum procedures, but also to finding space, training people, and overcoming the inertia of certain specialists who thought it better to manufacture a new fitting than to rebuild an old one.

The scientists came to the plant with more than just a good idea. They brought equipment, including a special UPU-3 unit, and immediately started inquiring about what part was giving production workers the most troupble from the viewpoint of wear resistance. It was clear they were giving priority to the interests of the enterprise with which they had concluded an economic agreement aimed at obtaining a tangible impact.

So, the mandrels were selected for plasma spraying. In the course of shaving, this particular accessory is subjected to high loads, and its operating life had been less than 160 hours. They had to work hard to choose the best material for the protective coating. In the end, they settled on two types of powders made of intermetallides. One provides the substrate, the other is sprayed on top of it. This is more durable, because without precoating, the "armour" obtained is brittle and spalls under impact.

The whole technological process is quite simple. The worn part is initially tempered and then turned down, that is, its dimension is reduced so as to provide room for the protective coating. We then need to cut a broken thread, scour the part, and then shotblast it. The spraying itself takes just minutes. As you can see, many of these processes do not require unusual skills, and some can be done by a single person, the operator himself. That is what I. Lin does. But in the near future, when the work volume at the plasma-spraying sector is considerably higher, we plan to institute a two-shift schedule and assign an additional lathe operator, grinder and operator.

Those at the MZSh closely followed the progress of the experiments, and even the skeptics soon understood that production was receiving tangible benefits in the form of tens of thousands of rubles a year in labor and materials savings. The operating durability of the same shaved mandrel after hardening is two to three times greater. It was decided to install the sector in a separate premises. The problem of production space is very critical for the gear plant, which is located in the center of the city. And the only place the sector equipment could be set up was in the tool shop. In order to get around this, we had to relocate the electroplating units and set up the plasma spraying in that space.

This plant now does more than rebuild worn mandrels. It hardens new tools as well. We know, for example, that the service life of a grinder spindle is two to three times shorter than that of the machine tool itself. It is usually scrapped. However, why not try to make them equally durable? In order to do that, we need to harden that part of the spindle subject to the greatest wear, the neck. This task was set the plasma spraying sector. This year, the sector will be treating the first 50 such new spindles. It is equally tempting to try to improve the wear resistance of the forge dies, as the MZSh "hearth" is one of the largest at all the Minsk enterprises. Joint work is already being done along this line.

The equipment brought from the Belorussian SSR Academy of Sciences' FTI is already the property of the tool-makers. Incidentally, those here considered it their own even before the official transfer, because it was they who had made the effort to find a suitable place for it, they who had worried about making it convenient to use.

At the MZSh, the plasmatron is becoming as necessary as a lathe turning tool.

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OTHER METALWORKING EQUIPMENT

UDC 621.73.001

CREATION OF NEW FORGE-PRESS EQUIPMENT REVIEWED

Moscow KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO in Russian No 1, Jan 86 pp 7-9

[Article by V. V. Karzhan: "Creation of New Forge-Press Equipment and Improving its Pool on the Basis of Progressive Technological Processes OMD [Working Material by Pressure]]

[Text] Today, the effectiveness of the forge-press equipment pool is evaluated by the constantly growing share of progressive automatic and metal-saving equipment which depends on the structure of the output.

The Minstankoprom [Ministry of Machine Tool and Tool Industry] ("Soyuzkuzmash-VPO [All-Union Production Association]), as the basic creator and supplier of KPO [Forge-Press Equipment], since the 10th Five-Year Plan, implemented the accelerated mastering of progressive kinds of KPO as compared to traditional ones. Nevertheless, the share of these machines in the pool is still small. Due to the imperfect structure of the KPO park, the output of products and use of reprocessed materials are not being fully realized.

According to statistical data, there is still considerable waste of ferrous metals in machinebuilding industries.

This is one of the consequences of the extensive development of RShP [Forge-Press Production]. Therefore, the USSR Minstankoprom outlined ways for an essential improvement in the structure of the output of primarily automatic KPO.* This equipment will be suitable for the realization of the following directions of development of progressive resource-saving technology of working metals with pressure:

reduce waste in manufacturing deformed products by reducing or eliminating fins, reducing burning, tails, optimizing layout and increasing the precision of products manufactured by dividing operations;

increase the precision of forgings and intermediate products by reducing tolerances and the formation in forgings cavities, ribs and projections which save metal and reduce the amount of machining;

*Balmont, B. V. Production of automatic equipment must be developed. KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO, 1984, No 5, pp 3-8.

automate the process to a maximum to improve productivity and labor conditions.

This will save material, power and manpower resources in the national economy.

In the report of M. S. Gorbachev, General Secretary of the CPSU Central Committee "Cardinal question of the economic policy of the party" at the 11-12 June, 1985 conference of the CPSU Central Committee, a specific problem was posed: "... satisfy by 75-80 percent the increased requirements of the national economy in fuel, raw and other materials by saving them."

At present, in order to solve this problem in forge-stamping production, the subsector created a series of new automatic KPO for four basic technological conversions: hot and cold die forging, sheet stamping and reprocessing non-metallic materials. The most important KPO mastered is equipment for precision free forging and low-waste hot die forging with automated and mechanized facilities.

Five and 12.5 meganewton hydraulic forging presses with a bottom location of working cylinders are supplied in a set with manipulators and other facilities for NC automation, while forging presses with an upper drive are also supplied in a set with manipulators.

A 3.15 meganewton NC industrial prototype of a high productivity set of equipment was created for free forging of complicated forging in small series and single unit production. When used to manufacture intermediate products for shafts, cubes, flanges and rings, about 10 percent of the metal is saved because of increased accuracy in forging. The set was introduced at the Kiev SPO [Union of Consumer Societies] imeni Gorkiy.

The mastering of the production of 0.2-2.5 meganewton NC radial-reducing machines with mechanization facilities has begun. Some 30 to 50 percent of metal is saved and labor productivity increased 1.5-2-fold.

Automatic forging rolls are manufactured in series for precise transverse-wedge rolling used for the final shaping of intermediate products for stepped shafts. They save 20-35 percent of the metal and productivity is increased 10 to 15-fold as compared to machining. The same rolls are used for the preliminary shaping of intermediate products before die forging which makes it possible to save 5-7 percent of the metal and increase productivity 1.5 to 2-fold.

Hot die forging complexes are mastered by using 10 to 125 meganewton forging presses, as well as complexes using 1 to 4 meganewton screw presses with an arc-stator drive. Labor productivity increases 1.15 to 1.5-fold. Some 3 to 5 percent of metal is saved and up to 10 percent of metal is saved in combination with preliminary shaping (rolling).

Automatic equipment complexes were created for low waste die forging with detachable female dies using crankshaft hot die forging 5/5 and 8/8 meganewton double action presses, 1.25/1.25 meganewton double action screw presses and 4 x 1.6/3.15 meganewton hydraulic multiplunger presses, etc. Some 15 to 50 percent of metal is saved.

1.25 and 2 meganewton hot die forging automatic machines (GShA) were mastered for manufacturing bars, nuts, rings, as well as 12.5 meganewton GShA lines for manufacturing ball bearing rings. Die forging on GShA saves up to 15 percent of metal and raises productivity 1.8 to 2-fold as compared to die forging in automated complexes.

Automated and automatic equipment for low-waste cold die forging using 2, 5 and 10 meagnewton knuckle-joint extrusion presses for cold extrusion were mastered. Sets for the die forging of products from single intermediate products using a 5 meganewton two-crankshaft closed die press with a manipulator are shown on the cover. These sets manufacture low-waste intermediate products saving 50 percent of metal; productivity as compared to cutting increased 4 to 5-fold.

There is equipment for pressing and sizing metal powders using a series of 1.6 to 10 meganewton hydraulic presses, 1 to 4 meganewton mechanical automatic presses, as well as special automatic machines. Powder KPM [forging-press machines] are an efficient means for saving metal. One to 4 meganewton cold-upsetting automatic machines and complexes, previously created for manufacturing fastening products and other products, were renovated.

New automatic complexes using 1.0 and 2.5 meganewton crankshaft section shears for precision cutting round and square bars 20 to 80mm in diameter were assimilated. On order by a customer, the complexes can be equipped with a metal heater ahead of the cutting. Two to 4 percent of the metal is saved and productivity increases 2 to 5-fold. The obtained intermediate products are used for subsequent deformation, as well as for machining.

Equipment for sheet stamping and layout operations. These are NC automatic complexes using sheet shears with oblique blades with loading, feeding and unloading devices. They make it possible to lay out sheets efficiently (practically without waste), save 2 to 6 percent metal, sort the cut strips according to size, staple them and reject scrap.

An 0.4 meganewton NC machining center was added to the coordinate-turret press which is 2.5 to 3-fold more productive than the turret press of the same force. It saves 5 to 10 percent metal when drop forging various sheet products.

A comprehensively automated computer controlled sheet drop forging section is being created using an 0.4 meganewton turret machining center. This section is the first prototype of flexible readjustable systems (GP system) using drop-forged GP modules.

Series production was assimulated of three type-sizes of 0.4, 2.5 and 4.0 meganewton automatic presses for the finished blanking of products from strips and tapes. The process achieved in these machines permits precise manufacture with clean external and internal contours of parts without further machining. The productivity increases 5 to 8-fold.

Forge-press equipment for reprocessing plastics and nonmetallic materials. Up to 20 meganewton presses and automatic presses are manufactured for making articles from thermosetting plastics. They are used in automatic complexes with screw conveyor plastisizers.

Casting machines, thermal and thermosetting automatic machines, single and multiposition machines with cyclic and NC controls are manufactured for making articles from thermosetting plastic materials. Thermosetting plastic automatic machines with rated injection volumes of up to $4000cm^3$(eight type-sizes) and with an injection volume of up to $1000cm^3$ were assimilated.

In the four considered technological groups, there were not mentioned some newly created kinds of KPO, equipped with automatic and mechanization devices with higher reliability and productivity (robotized steel drop forging complexes, some types of NC KPO, for example, bending machines, etc.). It should be stressed that this equipment together with resource-saving machines of the four technological groups make up progressive (priority) KPO. The productivity and reliability indicators of the entire KPO output increased 1.5 and 1.49-fold respectively by the end of 1985. Consolidated calculations show that the instroduction of new KPO manufactured in the 11th Five-Year Plan period, as a result of saving metal and power, as well as increased productivity will make it possible to save 1.2 billion rubles. Over 130,000 workers will be freed in intermediate product production and machine shops.

The results of the 11th Five-Year Plan period in the forge-press machinebuilding subsector are only the first steps in shaping a progressive KPO structure on the basis of advanced OMD technology.

Problems for the 12th Five-Year Plan period are based on the accumulated experience, as well as the use of results of investigation and forecasts of KSHP of the country carried out by the "ENIKmash" Scientific Production Association in 1983-1984 jointly with 42 industrial technological institutes.

Problems of the accelerated development of technological progress posed by the party call for an increase in the coming period in the output of machinebuilding and metalworking which will mean a corresponding increase in the reprocessing of materials in forge-press production.

The growth rates in individual technological conversion are assumed to be unequal so that, for example, reprocessing volumes of new kinds of materials and traditional materials by progressive methods will increase at accelerated rates. This concerns the reprocessing of metal powders, plastics and other nonmetallic materials. In the production of die forged intermediate products of ferrous and nonferrous metals and alloys, the greater growth will remain in sheet drop forging and in hot die forging.

The problem is posed of increasing the efficiency of reprocessed materials at constantly decreasing power and labor expenditures.

To evaluate the material, the consumption of OMD processes known coefficients of metal use in parts -- KIM_d, intermediate product -- KIM_z and the coefficient of weight accuracy KVT:

$$KIM_d = \frac{Md}{N_r}; \quad KIM_z = \frac{M_z}{N_r}; \quad KVT = \frac{KIM_d}{KIM_z} = \frac{M_z(p)}{M_d}$$

here M_d — weight of part; $M_{z(p)}$ — weight of intermediate product (forging); N_r — consumption norm.

KIM_d characterizes material wastes at all technological conversion of manufacturing the part -- from the preparation of the metal material to finishing operations; KIM_z indicates losses in the conversion of forge-preparation; KVT; being an indicator of the perfection of the intermediate product characterizes material losses in chips when machining.

According to investigation data and forecasts for the period up to 2000, waste losses for all reprocessed materials will be reduced. Waste in chips is also decreasing.

A more efficient consumption of material in KPO with a corresponding reduction in power and labor expenditures will be obtained by introducing progressive resource-saving very efficient technological processes, assimilated in production and lending themselves to automation.

An increase in the reprocessed material must conform to ratio

$$\Delta M_{per} = \frac{E_m}{K_{ed}} \qquad (1)$$

here E_m — material saved; K_{ed} — material saving coefficient set.

For the entire area of material production, this coefficient is $K_{ed} = 0.75$ to 0.80. It must be provided by a complex of organizational-technical measures starting with the quality of the initial material (metal), the conditions of its transportation and storing to the maximum reduction of metal consumption in the products when they are designed and manufactured. This coefficient can be presented as a sum of coefficients for saving material.

$$K_{ed} = K_{e1} + K_{e2} + K_{e3} + \ldots + K_{ei} \qquad (2)$$

We will assume that K_{ei} is the material saving coefficient, dependent upon the progressivity of the OMD and KPO processes.

For KShP conditions:

$$E_m = K_{e1} \quad \Delta M_{per}; \qquad (3)$$

$$E_m = \Delta IM_d \; M_{per.p}; \qquad (4)$$

here $\Delta KIM_d = KIM_{dp} \quad KIM_b$ -- increase in the utilization coefficient of material of the part in the planned period as compared to the basic period; $\Delta M_{per} = M_{per.p.} - M_{per.b}$ -- increase in the processed material in the planned period as compared to the basic period.

From equation (3) and (4)

$$K_{el} = \Delta \, KIM_d \frac{M_{per.p}}{M_{per.p} - M_{per.b}} \qquad (5)$$

or

$$K_{el} = \frac{\Delta \cdot KIM_d}{1 - \frac{100}{P_{rp}}} \qquad (6)$$

where $P_{rp} = \frac{M_{per.p}}{M_{per.b}} 100$ — indicator of the increase in volume of reprocessed materials, percent.

Data on the structure of the reprocessing of materials, including progressive processes, for 1986-1990 and the year 2000 must be considered as the initial material for the formation of a progressive structure for the KPO output for these periods which, in their turn, influence the structure of the future KPO pool.

Taking into account the actual utilization of the KPO pool, as well as the higher productivity of progressive machines, the total number of KPO produced will be reduced somewhat.

The main distinguishing feature of the proposed structure of KPO output is a sharp increase in the share of resource-saving technological systems (complexes, lines, GP modules, GP systems) in the total KPO output.

The second qualitative difference is in the increase of the upper capacity boundaries of a number of machines, for example, automatic hot die forging machines to 25 meganewtons, cold die forging machines to 16 meganewtons and blanking to 25 meganewtons.

Crank hot die forging presses (KBShP) will be made with capacities of up to 160 meganewtons, KGShP double-action with capacities up to 12.5/12.5 meganewtons, coining presses with capacities up to 25 meganewtons, etc.

GP modules and GP systems will again be assimilated and series production will begin in the 12th Five-Year Plan period. By 1990, it is planned to assimilate series production of GP modules for six different technological processes, including resource-saving GP modules using 2.5 meganewton cutting shears for precision cutting, machining centers with turret presses, 40 meganewton KGShP and casting machines with an injection volume of $125cm^3$. It is planned to create and assimilate rollers for transverse-wedge rolling for precise shaping in a double roll version with 630 and 800mm between centers. During that period, KGShP triple-action will be created for die forging with detachable female dies, a large list of parts such as connecting rods, levers, fittings, with total

forces of up to 20-25 meganewtons. It is also planned to create a series of presses for half-hot extrusion.

It is expected that the realization of the outlined measures will essentially improve the technical economic indicators of the KShP.

The following can be proposed for further KShP development.

1. It is advisable to develop plans for KShP development in basic KPO consumer-sectors, taking into account its systematic improvement.

2. The same sectors must organize a clear-cut system for determining the KPO requirements and issuing requests to the USSR Gossnab. The system should envision the availability of production areas, financing, preliminary familiarization with the KPO being acquired, especially the new progressive ones, and corresponding preparation for operating the KPO with a high technical standard.

3. It is necessary to establish an All-Union order for the following: write-off outdated KPO with the goal of reducing the annual norm of 3.5-4 percent; provision of a labor force for the KPO pool; growth of output-capital ratio.

4. In the 12th Five-Year Plan period and the following period, it is advisable to establish, in basic machinebuilding and metalworking sectors that have many KShP annual goals for the introduction of progressive OMD technological processes with a corresponding increase in KIM_d and KTM_z.

5. It is advisable to introduce in the Central Statistical Administration report data not only on forging and hot die forging, but also on other technological conversions by pressure processing, including cold die forging and sheet drop forging, pressing metal powders, plastics and others with a separation of the volumes of output using progressive methods. The report should include KIM indicators. This would make it possible to evaluate the technological structure of the forge-press production more objectively, trace the degree of its improvement by years and five-year plan periods and, therefore, affect its improvement more effectively.

6. One of the basic conditions for uplifting the KShP of the country to a high technical standard is the specialization and concentration of production within the sectors, as well as in economic regions. This is especially important with the increasing KPO productivity, its greater complexity when, in one enterprise, highly efficient systems and machines are found to be underloaded or do not have skilled personnel to service the new equipment.

Problems on the sharp improvement in concentration and specialization must be reflected in industrial plans for the development of KShP, taking into account intraregional and interindustrial specialization.

The realization of the outlined measures on the development of machine building will facilitate further improvement in forging and drop forging production.

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OTHER METALWORKING EQUIPMENT

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FORGE-STAMPING PRODUCTION IN NEW FIVE-YEAR PLAN REVIEWED

Moscow KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO in Russian No 1, Jan 86 pp 4-6, 7-9

[Article by N. I. Yendovitskiy, Deputy Minister of the Machine Tool Building and Tool Industry of USSR: "Frontiers of Press Forging in the 12th Five-Year Plan"]

[Text] In decisions of the April (1985) Plenum of the CPSU Central Committee and the June (1985) conference of the CPSU Central Committee on accelerating scientific technological progress and switching the economy of the country to the intensification of rates, machine tool building will play a leading role. But for machinebuilding to become a reliable basis of the reequipment of the national economy, it is necessary to implement it very strongly with the newest equipment and technology.

Here machine tool building whose hands hold the levers for renovating machine-building enterprises and, therefore, also of the entire material economy will have a decisive role.

Machine tool builders must organize the mass output of a new generation of machines, capable of increasing labor productivity many times and opening up a way to automate all stages of the production process.

The goals and tasks of the machine-building industries in the 12th Five-Year Plan have been set as follows: a radical rise in the technical level, the quality of manufacture, and competitiveness of equipment produced; a swift changeover to production of a new generation of machines capable of providing for the introduction of progressive, particularly energy-saving, machinery; high mobility of the entire technological production potential of the sector, the ability to react rapidly to the dynamically changing needs of the national economy in progressive equipment, and a considerable increase in efficiency and a reduction in the time for completing scientific research and experimental design work.

The tasks faced by the machine tool sector were specifically outlined by Comrade B. V. Balmont, USSR Minister, in his article "On measures for accelerating scientific technological progress in the machine tool building and tool industry in the light of the April (1985) Plenum of the CPSU Central Committee, and decisions and conclusions in the report by Comrade M. S. Gorbachev, General CPSU Central Committee conference in 11-12 June 1985."

In 1986-1990, accelerated rates are planned to increase the production of commercial products of machinebuilding and metalworkings as compared to the previous five-year plan period.

In the forge-press subsector, it is necessary to increase the productivity of labor for net product norms, reduce costs per ruble of commercial product and the labor-intensiveness of the output, and increase the use of ferrous metallurgy rolled stock.

The realization of problems posed before the subsector is tied to improvement in the management of production associations (enterprises), especially in the area of planning and organizing production. It is necessary to utilize available capacities to the maximum, raise the shift coefficient of equipment operation, especially of NC equipment, the automatic lines and flexible production modules.

An important place in solving problems on increasing the productivity of labor is the reequipment of enterprises, introduction of progressive technology, mechanization and automation of production processes and improvement of labor conditions have important places.

Before 1 June 1986, a general inventory of funds will be made in production associations (enterprises). The results will be used in long-range programs to reequip and modernize each production subdivision. If necessary, modernizations will be revised to take into account scientific technological achievements so that enterprises will operate using progressive technologies.

In modernizing existing enterprises, it is planned to use fully the fund for developing enterprises and increase to 50 percent the share of this money in the general volume of capital investments allotted for the construction of production facilities.

In the course of reequipment and modernization, it is necessary to accelerate the renovation of the active part of fixed production capital (annually to 10-12 percent) and carry out sequential measures on changing traditional technologies by using laser, electrochemical, electrophysical and other progressive methods.

Taking into account the fact that equipment manufacture is basically labor-intensive and involves reprocessing of coarse metals and machining, it is necessary, in forging and blank preparation production, to implement a changeover to manufacturing precise intermediate products by using progressive metal-saving methods (semihot die forging, forming in the superplasticity mode, hot die forging in automatic and semiautomatic lines, roll-burnishing, upsetting, extruding, mechanized and automatic processes for reprocessing sheet metal).

As a result of the consistent implementation of these measures, it will be possible to increase the output of intermediate products by progressive methods in the total volume of their production.

Thus, the modernization and reequipment of existing enterprises must be comprehensive and span the entire production cycle — from the arrival of raw and other materials to the shipment of finished products.

To provide for the reequipment, the USSR Gosplan and the USSR Gossnab must meet the full requirements of machinebuilding ministries in metalworking, electrothermal equipment, welding, painting and other technological equipment.

The second way of increasing capacities is to expand existing production associations and introduce new capacities for the production of the most important types of technological equipment.

New capacities must be introduced in forge-press production for the output of forge-press equipment with the means for the automation and mechanization of flexible production modules; heavy and special design NC forge-press machines, automatic lines and forge-press complexes.

We envision the introduction of new capacities in the following: the Khmelnitskiy PO [Production Association] for the output of thermoplastic automatic machines, the Salsk Plant KPO [Forge-Press Equipment], the Ivano-Frankovsk Mechanical Presses Plant, the Ryazan PO "Tyazhpressmash," the Barnaul Mechanical Presses Plant, and the Voronezh Heavy Mechanical Presses PO.

Taking into account the intensification and expansion of specialization and cooperation in machinebuilding is an important factor in increasing machinebuilding output, reducing cost and labor intensiveness, it is planned further to expand and modernize specialized enterprises for the production of standardized units and parts, In the forge-press production subsector, it is also necessary to implement the program for the development of cooperative manufacturing of standardized units, while designers of forge-press equipment must make wider use of newly developed designs of machines, standardized units for general machinebuilding use manufactured at specialized enterprises and enterprises of the subsector. However, modern equipment alone without the skilled organization of the labor process will not produce the proper effect. Conscious and high discipline in work are necessary. It is necessary to accelerate the change to the brigade form of labor organization using the brigade contract and cost accounting principle. In the forge-press production subsector, in the 12th Five-Year Plan period, the number of workers in brigades working under the contract and cost accounting conditions must already make up 33 percent of the total number of industrial-production workers in 1986.

Machine tool builders must create machine tools and forge-press machines corresponding to advanced achievements in the equipment produced and consider the increase in the technical economic standards of output as the most important duty and norm of each production and scientific collective.

In 1986-1990, it is necessary to create and produce equipment which, in productivity and reliability, exceed not less than 1.5-2-fold previously produced similar equipment. The new products must be fully automatic and mechanized in the production processes in all national economic sectors.

This means that in 1986-1990, it is necessary to renovate further the forge-press equipment, increase the share of equipment, produced in three years in the total volume of commercial products, improve the structure of forge-press equipment and accelerate the development of heavy and special design presses, all kinds of NC equipment, flexible production modules and automatic and semiautomatic lines.

In 1986-1990, it is planned to develop and assimilate the output of the most important kind of new generation equipment: 4 meganewton radial-reducing machines, 40 meganewton multipositional sheet-stamping three-coordinate automatic machines, flexible production modules for sheet stamping using 1 and 2 meganewton single-action presses, 0.4 meganewton turret presses, flexible production modules for cutting intermediate products with round and square cross sections with 2.5 meganewton section shears, 40 meganewton hot-stamping presses for hot die forging, casting machines for casting thermoplastic machines under pressure with an injection volume of $105cm^3$, sheet shears for cutting rolled stock up to 2000mm wide and 4-6mm thick, and computer controlled automatic rotary lines for manufacturing tubular rivets, automatic rotary conveyor lines for manufacturing plastic parts and other progressive equipment.

The distinguishing feature of the forge-press equipment in 1986-1990 must be flexibility and efficiency at a high automation level. This means that it is necessary to create readjustable automatic centers, sections and lines and increase the automatic feed of materials. Great attention must be given to the improvement of the reliablity of electric and hydraulic drives, devices for fixing and changing tools and dies, control and monitoring systems, as well as the reliability of safety devices.

Acceleration in creating new equipment must also proceed on the basis of producing machines which were developed to use unit-module designs.

The success of the development of the forge-press production subsector depends directly on raising the quality and efficiency of scientific research, experimental-design and planning-technological organizations in the sector. In this connection, it is necessary to develop experimental bases, and laboratories; direct for that purpose not less than 8 percent of capital investments for the construction of production nature facilities. By 1991, the construction and expansion in the Forge-Press Machinebuilding Institute (Voronezh) will be completed of its engineering-laboratory building for machining structures of automated forge-press complexes.

To provide for rapidly changing conditions and characteristics of the production processes of machinebuilding, it is necessary to reduce the time for creating forge-press equipment. This problem will be solved in the subsector in design, technological and scientific research organizations, as well as in associations and enterprises that have the tasks of creating new kinds of products of importance to the national economy, including the concentration of technical facilities for automatic design.

To prepare conditions for the production of new equipment, it is necessary to develop and increase the role of tool and other shops for the preparation for production at enterprises.

The production potential of such shops must be not less than 7 to 10 percent of the designed capacity of the enterprise.

For flexibility of production preparation in mastering the output of new equipment at enterprises of small series production, it is necessary to organize shops in the nature of small series production with flexible production systems. These capacities must be used exclusively for the timely preparation for production and mastering the output of new equipment.

To strengthen moral incentives for scientific technological progress, a new title was established in the 12th Five-Year Plan period of "Distinguished Machinebuilder of the USSR." This title will be awarded to workers who have achieved outstanding successes in creating new kinds of machines and organizing planning and production.

With the design of forge-press machines becoming more complicated, greater demands are made on their reliability. The reliability of a machine depends on the design, as well as on the manufactured quality of its individual parts and units. Therefore, special attention must be given to the question of raising quality at the design stage as well as in the manufacturing and operating of the machines.

The quality of output must be at the center of attention of all collectives. Indicators of its evaluation and the systems of moral and material incentive must be improved. Since quality depends greatly on the regularity of work in executing planned tasks, and the strict observance of the technological discipline, this direction must be improved, shortcomings must be detected rapidly and measures must be taken to eliminate them. In production associations (enterprises), it is necessary to check the technological discipline in a very short time and develop and implement additional measures on the strict observation of technological processes, specifications and government standards.

Intermediate operation-by-operation quality control of parts of units in the progress of the technological processes must be strengthened as well as the quality control of incoming materials and products in stock.

The forge-press production subsector must, in connection with more rigid demands on the product quality, increase the share of highest category of quality products to 54.6 percent in 1986.

This will be facilitated by the work done in the subsector on increasing the reliability of the manufactured equipment and complementing products, supplied by associated ministries.

Technical projects created in institutes, design organizations and enterprises must contains promising directions for technical progress, which would insure the creation of high technical standard and quality, reduce unit power consumption (7 to 12 percent) and unit metal consumption (12-18 percent).

The implementation of measures on raising the technical standard and quality of products will make it possible to increase the competitiveness of the forge-press equipment in foreign markets and will expand considerably its sales for foreign currency,

The goals for the 1986 national economy plan, the first year of the 12th Five-Year Plan are directed toward the wide utilization of the scientific technological revolution. Already in 1986 as compared to 1985 the output of NC forge-press machines will increase 1.4-fold.

In the first year of the new five-year plan, the realization of the decrees of the April (1985) Plenum of the CPSU Central Committee and the June (1985) conference of the CPSU Central Committee on questions of scientific technological progress will have great importance for the further implementation of social economic problems in our country "...We must achieve essential acceleration of social economic progress," stated Comrade M. S. Gorbachev, General Secretary of the CPSU Central Committee, "There is no other way for us."

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OTHER METALWORKING EQUIPMENT

RESERVES IN MACHINE-BUILDING INDUSTRY NOTED

Moscow ZNANIYE-SILA in Russian No 2, Feb 86 pp 8-10

[Article by K. Frolov, vice president of the USSR Academy of Sciences, director of the Blagonravov Institute of Machine Science of the USSR Academy of Sciences, under the rubric: "Towards the 27th Congress of the CPSU," passages in slant lines printed in boldface]

[Excerpts] Substantially accelerate the development of machine construction. Radically improve the technical level of the manufactured goods. Support the development and adoption of production of new generations of technology, enabling a many-fold raising of the labor productivity and substantial lowering of material expenses. Fortify the material and scientific-technical base of the machine building industry. (From the project of the Basic Guidelines of Economic and Social Development of the USSR for the Years 1986-1990 and the Term up to the Year 2000)./

The principal goal of machine building is to widen the production, not simply of machines, but of fundamentally new generations of machines with unvarying quality assurance. The quality of machinery is a remarkably multifaceted concept. Besides such obvious requirements as performance of machinery, reliability, precision, faultless operation, there are many others: easy repairability, safety, absence of unnecessary noise and vibrations, patentability (absolute novelty, if not of the entire machine, then at least its basic assemblies). We may also add the requirement of ergonomics, industrial esthetics, industrial hygiene, ecology, etc. Oftentimes the meeting of quality requirements is further complicated by the need to resolve contradictions, as is typical of a multiple-criteria problem.

But the crux of the matter is the necessity of achieving an economy of all types of resource--material, energy, labor--during all the stages of development, construction and operation of the machines, with no exceptions. Such economy is the major source of expansion of machine production and simultaneous quality assurance. And while we shall endeavor in this article to discuss the economy reserves in machine construction, we shall be using the concept of machine quality in the broadest sense of the term. Everything in this field is interconnected, and must be examined as a single entity.

The Design Process: Economy at Present and in Future

We are beginning the design of a future machine. Essentially, we are traveling into the future. The engineer is required to outstrip the present--a severe and unremitting demand. It is no accident that the literal Latin translation of "project" is "a throwing forward." The time for the design process, the testing of the new models and the term of reliable operation of the designed machine, taken together, even with the current rapid alternation of technologies, involves several years, a decade or even longer. Therefore, the designer of the present day should invest his machine with such qualities as will hold up, physically and conceptually, after a dozen years. In other words, an economy of resources should be achieved both today and for the future.

The design process, furthermore, must discover optimal design versions for parts and machines to enable an improvement in a spectrum of properties--reliability and durability with mandatory lowering of the costs of metal, energy and labor in the development and operation of the machine. For this, we employ mathematical and experimental data as to the loads and strength and probability methods of evaluation of durability and reliability on the basis of a thorough understanding of the subtle physical and mechanical processes of wear and failure in realistic or experimental situations. Mathematical probability methods are also used to establish the terms of repair and the manufacturing volume of replacement parts. An optimal design process today is only possible by consideration of a large number of different criteria and requires the use of computer-aided design systems (SAPR). Such systems combine the automated processing of an enormous volume of design information by minicomputer and mainframe computer into a unified whole, putting out the resulting information on displays and graph plotters. The system may be shared, with the option of "designer-computer" interaction. The systems also include computer-aided personal designer work stations (ARMK).

The reserves of design time and quality made available by computer-aided design systems go without saying. After all, design projects have frequently taken more time than the fabrication, testing and optimization of the machines themselves.

The design time is shortened not only by virtue of the speed of the computer and the opportunity of using a selection of many alternatives instantly proposed by the computer. Time is also saved by a "trial" fabrication and testing of machines, instead of constructing an experimental model "in metal," which as a rule takes months of intense effort on the part of the designers and testers of new technology. The SAPR, as it were, compresses months into weeks or even days.

And the main goal is achieved: an optimal-designed machine requires less metal, operates with less consumption of electricity, fuel and lubricants, and needs less repair work.

But it should not be forgotten that high-performance design electronics only operate successfully "under the guidance" of engineers who thoroughly under-

stand the modern methods of design. Hence, the construction of machines begins as early as the training of the young engineers, capable of future interaction with the latest computer technology.

Control of Friction: An Inexhaustible Source of Savings

The Institute of Machine Science of the USSR Academy of Sciences has developed a unique antifriction material: metal-fluoroplastic. This development reflects a general trend of using nontraditional materials (composites, ceramics, ferroconcrete) in mechanical engineering. Metal-fluoroplastic is a convincing example of the effective use of machine improvement reserves through the application of new materials with unique properties. It consists of a steel base, a thin (0.3 mm) porous layer of bronze, the pores of which are filled with a mixture of fluoroplastic and molybdenum disulfide. What does such an "exotic" material do? First, bearings made of this operate with little or no lubrication. What is more, in a broad temperature range: the lower limit of serviceability of the new material is -200 degrees! Needless to say how suited it is for equipment operating in the severe conditions of the North. Second, such bearings (of all varieties) are manufactured by simple forging. The cutting work is minimized and, consequently, the material consumption is extremely economical. It is practically a waste-free process. Further, metal-fluoroplastic bearings are 10-15 times lighter than the corresponding metal ones. The outer diameter is twice as small. A lighter and smaller bearing means that the entire metallic "encirclement" (housing and adjoining parts) is also much more modest in size and weight. We may add that metal-fluoroplastic bearings work well under overloads and possess high radiation resistance. Naturally, all these features of the new material were not simply a pleasant surprise to the scientists of our institute. On the contrary, these properties were foreseen and designed in advance.

Metal-fluoroplastic, as an extremely promising material, has brought to mechanical engineering a number of qualitatively novel opportunities of reducing machine weight and size. Such materials are being used today with great economic impact in aviation, automotive design, the electrotechnical industry, mechanical engineering for light and food industries. The time has come to organize a centralized production of metal-fluoroplastic material for all sectors of mechanical engineering.

A major increase in the lifetime of friction elements may be achieved by yet another fundamentally new technique. This concerns magnetic-active lubricating powders, supplied to the lubrication zone by a relatively weak magnetic field. Studies at our institute have shown that such lubricants work well in the most extreme conditions: high temperature, vacuum and so on. Magnetic powders create an ultrathin dampening layer of elastic porous lubricating material on the surface of the parts. This film is continuously replenished: the magnetic field continuously supplies new batches of powder to the lubrication zone. And the supply of lubricant can easily be adjusted by altering the magnetic field. After all, the possibility of exact regulation of the functioning of friction elements--and of the entire machine--is becoming an urgent necessity of modern mechanical engineering. The promise of the new lubrica-

tion method is demonstrated by experiments: gears with magnetic powder lubrication function 10-20 (!) times longer than the usual gears.

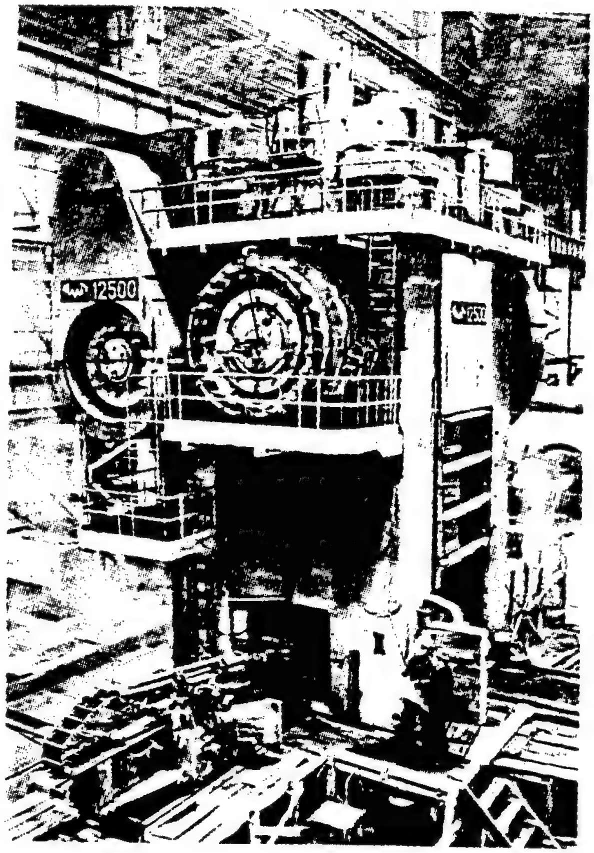
The new technology is also bringing new difficulties, heretofore entirely absent from practical mechanical engineering. Such is the dialectics of development of technical devices. For example, the use of machine tools with numerical control and precision mechanisms, as required by the new technologies, comes up against the problem of dealing with microdiscontinuities in the motion of the effector elements of the machines. For these, the smooth surface of the machine slides is by no means smooth. And the motion of the effector elements along such slides occurs in jumps, each minute knocking against "scratches" or sticking to the metal surface. It was necessary to create a new class of polymer coating, now known as "trankilit," and the trouble disappeared.

Substantial reserves in the battle against wear are present in wear-resistant surface layers. The thickness of the produced surface layer is usually small--several tenths of a millimeter. Even so, the result should be a virtually new material with special physical-mechanical properties. Such combination of different qualities in a single part is also an innovation in technology. Surface layers can be formed by plasma sputtering in vacuum or ion-diffusion in a glow discharge. The methods of cathode sputtering in a direct-current discharge or a high-frequency discharge, ion deposition and ion doping can also be used. The modern engineer should become well acquainted with the diversity of these methods and technologies and learn to employ them with maximum benefit.

The use of powerful laser light for specific alteration of the properties of friction surfaces is especially intriguing and promising. This is indeed a compound treatment method. After laser treatment, the coefficient of friction is greatly reduced and the surface microhardness increases. It is possible to melt on wear-resistant coatings or dope (i.e., refine with microimpurities) the surface layer. Furthermore, laser hardening often eliminates the need for finishing or final technological operations, since the surface after such hardening no longer requires further refinement.

The Institute of Machine Science of the USSR AS has developed a laser technological complex with programmed movement of the laser beam over the surface of the work. Such complexes are especially promising for use in flexible automated production.

Laser beam treatment of the most critical parts of all types of internal combustion engines increases their operating life by 1-1/2 to 2 times. Laser machining will bring a major change in agricultural machine construction. Laser hardening of several parts of grain harvesters has demonstrated that their wear resistance is increased up to tenfold! Given the severe working conditions of farm machinery, this may become a major source of economy of many kinds of resources.



2. A 12,500 ton-force press has been built at the Voronezh Heavy Mechanical Press Plant. It is designed for hot forging of large pieces and will be used as part of automated complexes and automatic lines.

Potential Economy in Diagnostics

Doctors are fond of saying "it is easier to prevent disease than to treat it." This statement is also perfectly applicable to our machines. For the determination of the actual loads experienced by machinery, systems of high-temperature and low-temperature cryogenic strain measurement have been developed. Strain measurement, explained in the most general terms, is the determination of the stresses and forces arising in a structure under the influence of various forces. Strain measurement systems include sensors of the stresses and deformations, transducers and amplifiers, and a computer with software. They are capable of operating in a broad temperature range: from -269 to +700 degrees, and of measuring the most diverse physical forces on actual machines, structures and parts. Mobile bus-mounted strain measurement laboratories have been developed, furnished with modern equipment and

computers. These provide all the indispensable measurements to industry in the initiation, adjustment and operation of nuclear and thermal power production equipment.

Once again, the demand for comprehensiveness is felt. On this occasion, in the area of diagnostics and testing of new materials. A comprehensive approach to the study of the structure and properties of metals is carried out by facilities of the type "IMash Alatoo" (i.e., "Institute of Machine Science"). These carry out a simultaneous, synchronized study of the metal structure, register the change in electrical resistance of the specimen under increasing load, and record its deformation diagram. All these steps may be performed in a vacuum or in various protective gas environments. The temperature of the specimen (from -50 to +1500 degrees) and the rate of change of the loads may be varied by a given program. The change in the microstructure during the testing is recorded by video magnetic recorder. Such powerful diagnostic arsenal can discover, in the direct sense of the term, the potential reserves of economy in the functioning of materials and machines.

In regard to vibration, a useful application has been found in the diagnosis of the condition of operating machines. Methods and instruments for vibroacoustic diagnostics have been created. The machine itself "notifies" the engineer as to its defects in the language of acoustic signals. In this case, diagnostics becomes especially swift. There is no need to disassemble the machines or mechanisms. All mechanics will understand how important this is: after all, disassembly of the mechanisms disturbs the run-in of the parts, which often leads to a shorter operating life.

Repair--Without Repair

More than 27 percent of all metal working lathes in the country are involved in overhauling of machinery and equipment. Roughly one-third of the machines repair other machines! Here is another tremendous potential reserve of savings.

Specifically, when we introduce no-disassembly vibroacoustical diagnostics at a machine building enterprise we thereby reduce the time of nonproductive standstill of equipment, consumption of spare parts, fuel and oil, labor expenses and so forth. This measure alone leads to a number of major economic consequences. Which is understandable: after all, there is a radical change in the very concepts of "repair" and "term of repair." While previously maintenance and repair had been specified in terms of the average presumptive (and let us note, approximate) onset of critical wear of the machine, today we may consult an exact diagnosis of the condition of a given machine at a given time. Again, the analogy with medicine suggests itself. Imagine a group of patients being treated all at once in terms of the unvarying mean-statistical indexes. Or a group in which each receives strictly individualized treatment. There can be no doubt which group will receive the better treatment.

What innovations may be anticipated in repair procedures?

There is a trend to "heal" even serious damage in machines without performing a general repair of the entire structure. Naturally, this is only possible with a profound understanding of the entire mechanics of failure. One such promising repair method has been developed at the Institute of Machine Science in conjunction with the "Leningrad Metal Plant" Production Association. It is to be used primarily for rehabilitation of large-scale equipment, for which replacement or overhauling is too expensive a proposition. For example, large hydraulic turbines have been repaired by melting a very ductile metal into the damaged site. The ductile metal becomes a barrier to the spread of the threatening crack. It has been possible to slow down and halt a defect by preventing it from reaching a critical size. The new repair method has been successfully employed for a large hydraulic turbine of the Ust-Ilimskiy GES and other facilities. The extent of its use is being enlarged to mining equipment and construction/road-building machinery operating in the severe conditions of Siberia and the Far North. Expensive equipment, the mere transport of which to the work site is costly, receives (as it were) a new life.

The above examples vividly illustrate the importance and undoubted effectiveness of a comprehensive approach to the discovery of reserves of all kinds of resources at all stages of the development and operation of machines in different sectors of the economy.

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BRIEFS

SIBELEKTROTERM PLASMATRON--Specialists at the "Sibelektroterm association and scientists from the Thermal Physics Institute of the USSR Academy of Sciences' Siberian Department have created a plasmatron for use with an NC metal-cutting machine tool. The "RPT-2," as the new machine is called, is considerably more efficient and technically improved than similar machines in use today. [Text] [Minsk NARODNOYE KHOZYAYSTVO BELORUSSII in Russian No 2, Feb 86 p 2] 11052

'VM' TELETYPE LASER CONTROL--Developed jointly by scientists at the Physics Institute imeni P. N. Lebedev (USSR Academy of Sciences) and the vocational-technical school and plant attached to the ZIL, this high-precision device will be able to check machining finish, vibration and subassembly travel at a distance. Tests on it begin today at the plant imeni I. A. Likhachev [ZIL]. The device will be used to develop a series of laser controllers. [Text] [Moscow VECHERNYAYA MOSKVA in Russian 24 Mar 86 p 1] 11052

ZIL LASER CONTROLLER DESCRIBED--Scientists at the Physics Institute imeni Lebedev (USSR Academy of Sciences) and the vocational-technical school and plant attached to the "AvtoZIL" production association have met their joint socialist obligation to develop a sensor capable of monitoring metalworking and the status of equipment at a distance six months ahead of schedule. This development is an extremely important step in the struggle to improve product quality, to improve the reliability and durability of machinery. The basis of the new device is its semiconductor laser, whose beam is capable of closely tracking the surface finish of material being worked, the vibration and travel of subassemblies, and so on. Importantly, the sensor monitors without contact, which considerably broadens the opportunities for using it in various branches of industry. The participants in this creative cooperation, specialists from the FIAN and the vocational-technical school and plant, initially planned to finish developing the sensor in the last quarter of this year, but it was decided, on the initiative of communists participating in the project, not only to develop the device, but also to begin testing it by the opening of the Party Congress. The obligation was met with honor. The device has been created and will be used as a base for developing a whole series of laser sensor-monitors, for which there is a critical need in modern production. [By N. Aksenov] [Text] [Moscow MOSKOVSKAYA PRAVDA in Russian 9 Mar 86 p 1] 11052

AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

IMPROVED GAP'S URGED BEFORE LARGE SCALE INTRODUCTION

Moscow TRUD in Russian 1 Apr 86 p 1

[Article by L. Volchkevich, professor, doctor of engineering sciences, chairman of the VSNTO [All-Union Council of Scientific-Technical Societies] Committee for Automation and Mechanization: "Robots and Economics"]

[Text] Two fundamentally different types of production operations have coexisted for a long time in present-day industry, almost never overlapping, and exerting no influence on one another. The first consists of highly automated and highly productive large-scale production operations which have only one fault, but it is an important one: They are based on specialized equipment and are not flexible; that is, they do not possess the capability of transition to production of any product. When there is a product change, this means that the major portion of the equipment must simply be written off regardless of its physical condition.

And the second consists of flexible production operations which have not been automated and which possess the broadest capabilities for reorganization to produce practically any product. But since they are based on general-purpose equipment with low productivity, they cannot function without direct human participation in all manufacturing and auxiliary processes without exception--and, as a rule, this participation is at the level of manual operations.

This "peaceful coexistence" is now coming to an end. Rapid product changes, the ever greater acuteness of the labor shortage and the increasing unpopularity of manual labor are presenting an urgent demand that a third type of production operation be added to the two traditional ones: flexible machine systems (GAP's). The only question is whether we will solve the social problems their creation involves without reckoning the costs or whether we will learn to combine these goals. One gets the impression that here we are starting out on the first road from the very outset.

There were plans to create in the country pilot demonstration sections for working out the necessary technical and organizational solutions. But it seems the situation is beginning to get out of control. A great number of enterprises, motivated by the promise of the GAP, but even more by ambitious and speculative considerations, are attempting to set them up even now or are planning to do so in the very near future. Yet what can be the result of this

kind of "frontal approach" and haste? This is something we should think seriously about before it is too late.

Creation of local flexible production systems (GPS) consisting of just a few units of equipment is not capable of substantially influencing the indicators of production even on the scale of entire shops. And GPS embracing 30-50 units require outlays of 15-20 million rubles. Hundreds of systems in the country would mean outlays in the billions. If resources are to be risked on that scale, there has to be confidence of an effective return. And that is precisely what is lacking today.

According to certain data, the cost of the means of production per unit equipment in GPS is 20-30-fold higher today, in the initial stage, than in flexible systems which have not been automated, systems consisting of general-purpose machine tools producing a complete product! Yet productivity is only 2.5-2.8-fold higher, and the number of workers is between one-third and one-fourth of what it was. Yet if one worker attends three or four units of equipment, which is dictated not so much even by the manual operations that remain as by the insufficient reliability of operation of this equipment, then "unmanned" production operations are as far away as the stars. The production cost of the product will at the same time be considerably higher than with unautomated production, and the capital investments are not paid back. Indeed even the number of workers made available in a conscientious reckoning of live and past labor proves to be fewer than the additional ones who have become involved.

That is a description of our "launching area" today. Under those conditions is there a need to make haste with a frontal assault? Obviously not. But what, then, is to be done? That question can be answered only by science. A special working group bringing scientists and production experts together has been created for that purpose within the framework of the GKNT. Yet so far science has not provided answers even to the simplest questions: Where and how should the GAP's be set up first?

Somehow the opinion has become established that the GAP's should be set up predominantly on the basis of metal-cutting machine tools with numeric program control (after the pattern of the machining center). But this is incorrect.

The high efficiency of automation, as experience over many years has convincingly shown, is achieved only on the basis of progressive technology, by using the principles of concentration of operations and making processes continuous. For instance, designs of automatic indexing machines have long been known; thanks to the simultaneous machining of pieces with many tools, productivity is increased by a two-digit factor. Carousel production lines and lines which combine the carousel and the conveyor belt, which combine multitool machining and continuity, increase productivity even by a three-digit factor. Why is there this stubborn orientation toward single-spindle equipment in creating flexible systems? Why are we trying to seek progress only by improving control systems and auxiliary processes? Is it once again mental inertia or the search for easier ways?

It cannot, of course, be said that present-day academy science and applied science have been sparing of their attention to GAP's. On the contrary, the scientific-technical literature is literally flooded with the flow of publications on this topic. Unfortunately, the attention paid to them is more in the form of a general glorification and enumeration of the brilliant prospects than analysis of the real difficulties and ways of overcoming them. Illusions are created thereby that it will be enough to solve the problem in technical terms--to put together a production system with industrial robots and microprocessor equipment, and the socioeconomic benefit in the form of a rise of labor productivity and elimination of jobs will unfailingly be achieved. In fact that probably will happen in the future. But remote prospects should not be confused with today's possibilities.

Reality demands that the energies of scientists and designers be concentrated on solving the problem of reducing the cost of GPS's and especially on increasing their productivity. Thus today's GAP's should be used not as a means of rapidly solving social and economic problems, but for the present as the main prototypes for a large-scale application in the future.

How do we see their future development? In the second generation of flexible systems the transition must be made to piece-by-piece machining with automatic readjustment of the equipment. This will make it possible to achieve a rise in productivity thanks to elimination of downtime for readjustment, to reduce the labor required for adjustment and attendance, and to minimize the stocks of pieces that must be maintained for assembly operations. Yet this requires solving quite a few complicated technical problems, above all to achieve automatic movement of the workpieces in all stages of the route they travel in the production process.

Solving these problems will create the prerequisites for the next generation of flexible systems, in which the rise in productivity will be achieved thanks to increasing the operating time to around-the-clock operation, and ultimately to continuous operation, including holidays, while attendance would be limited to the traditional two shifts. This means considerably increasing the reliability of operation of all components of the GPS--above all the actual processing equipment.

It is precisely where these and a host of other problems are solved more rapidly and effectively that prospects will open up for broad introduction of the GPS on a larger scale. But even then every specific enterprise will have to do an immense amount of preparatory work.

Large-scale introduction of flexible systems requires prior organization of the centralized production of their components. At present, virtually nothing is being produced. Every new GPS is designed to order, and the components for it are as a rule manufactured, modernized, improvised under primitive conditions and at very high cost. But the intensification of production and "GAP-ization" at any cost are incompatible categories.

The Basic Directions envisage for the new 5-year planning period a considerable expansion of the output of flexible production systems. This means that measures related to proper use of this expensive equipment at the local level cannot be postponed.

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AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

AUTOMATION USE AT KRASNYY PROLETARIY PLANT

Moscow ZNAMENOSETS in Russian No 11, Nov 85 pp 32-33

[Article by S. Pavlov, deputy general director of "Krasnyy proletariy" Machine Tool Building Production Association (Moscow), candidate of technical sciences]

[Text] At the June conference of the CPSU Central Committee, where the questions of accelerating scientific technological progress were considered, M. S. Gorbachev, General Secretary of the CPSU Central Committee, stressed that the especially important problem today is the organization of the mass production of new generations of equipment capable of increasing the productivity of labor many times and opening the way to the automation of all stages of the production process.

The robot is one of the directions for creating such new equipment. In the last year of the present five-year plan period alone, the national economy of the country received thousands of industrial robots of various types and for various purposes. They replaced thousands of workers, doing hard and tiring work. Robots made it possible to automate various operations and processes and increase sharply the productivity of labor. A graphic example of this is a shop of flexible manufacturing system for machining parts at the "Krasnyy proletariy" Plant, which began operating at the beginning of this year.

As in a parade, uniform rows of machine tools stand on the shining varnished floor of the shop. They are multioperational lathes, milling-boring machining centers, and grinding machines. Every one of them is equipped with NC. Beside the machine tools are receiving stations where, on instruction of an operation, robot-carts bring intermediate products on trays from automated warehouse-shelves. The mechanical arm accurately adjusts the intermediate product placed on the timing table by the operator; then the iron claw grips it and places it accurately into the chuck of the lathe. An instruction enters the NC system: the chuck clamps the intermediate product, the robot retracts the claw, the safety shield of the machine tool is placed in the proper position, indication lamps light up and the machining of the part begins according to the program. The robot, having taken a new intermediate product, stops, awaiting the end of the working cycle.

Let us say that the machining of the next in turn base of a future robot on one of the machine tools is completed. The operator, with the aid of the display keyboard, sets up the number of the machine tool, the number of the part, indicates the address where the intermediate product is stored and sends the message to the computer.

On the computer's instruction, the stacker crane selects the necessary intermediate product from the cell of the warehouse and delivers it to the loading platform at the "warehouse gate" on a tray. At the same time, the transport robot-cart begins to move. It moves smoothly to the loading platform by itself. The mechanical arm of the robot reloads the tray with the casting, lifts it to the "shoulders" and delivers it to the receiving station of the required machine tool.

The same robot-cart will transport a lot of finished parts to the assembly shop. The operating robots in the machine shop help manufacture parts and deliver them to the assembly shop for future robots.

There are only a few operators-adjusters in the shop. As a rule, they are young and work carefully without fuss. Their main job is to adjust the machine tool to manufacture the part indicated on the display. This is not a simple operation. The cycle for machining some housing parts is 5 hours long and dozens of tools such as cutters, borers, drills, taps, reamers, etc. participate in the process of their machining. Fewer tools are used in lathe machining centers, but here it is necessary to train robots to set up the intermediate products and remove finished parts.

Machining accuracy is high. The measuring systems of the machine tools are sensitive to micron differences. Correspondence of the part to the drawing is the responsibility of the operator, while the quality control department does only sample monitoring.

Young workers in the plant, before beginning to work in a flexible manufacturing system, have passed a theoretical training course at the plant. Then, the former turners, mechanics, grinders and millers, before receiving two new specialities -- operator and adjuster of a machining center, built warehouses, installed machine tools, laid high frequency cables for controlling robot-carts, ran wires from the control computers to display panels at work positions. This was also science.

Of course, along with workers, engineers were also involved in assimilating the new equipment. Frequently they can be seen in the shop even now.

Flexible manufacturing system at the "Krasnyy proletariy" has a clearly expressed special feature--between the automatic-transport system and NC automatic machine tools or machining centers, there is a highly skilled worker. Using data gathered by the computer and transmitted to the display panel he controls the production.

As shown in practice, the training period of operators-adjusters varies from 3 to 9 months. During that time the worker is paid an additional "stipend," which reduces losses in average wages to a minimum.

Workers must not only be programers. Today, nothing can be done at the work position without knowing the bases of cybernetics, electronics and robot equipment. Practical skills are no less important; the ability to evaluate whether the tool cutter or drill is ground properly, being able to measure with an accuracy of up to several microns, etc. In a word, a modern adjuster or operator must have the mental outlook of an engineer and the skill of an experienced machine tool operator. There are many such people in the shop.

Adjuster Aleksandr Mitrikov who heads a link of ten people with his comrades in three shifts, for example, services very complicated, five-sided, machining centers.

The success of the link is explained, in my opinion, by the skill of communist Mitrokov. Last year he, together with specialists, installed equipment in the shop and adjusted work positions in the prestart period. Workers of the shop elected him head of the link (here it is an elected position). He knows his job and is considered an expert. V. Grishin, A. Vorobyev, N. Lukyanov, S. Mayorov and A. Klyuyev report to him. Many workers in the plant study machine tool building at technical schools and institutes.

The entire production cycle -- from warehousing and issuing intermediate products to the delivery of parts for assembly is analyzed by a computer.

Thus, the comprehensive introduction of the latest modern equipment helped in the creation of flexible automatic system GAP in the shop of "Krasnyy proletariy."

Due to wide automation, including the use of a shop computer, productivity of NC machine tools increased 3.5-fold, of multipurpose machine tools with automatic tool change -- 5-fold. There are only 40 men in the GAP shop which with traditional production, would require 4 times as many workers and 3 times as many machine tools.

"Krasnyy proletariy" today is a rapidly modernizing enterprise that manufactures most modern metal-cutting equipment with microprocessors for which the plant was placed on the All-Union Honor Board at the USSR VDNKh. It has kindergartens, creches, pioneer camps near Moscow, plant dispensaries, a stadium and a machine tool building technical school. It has a remarkable multi-thousand collective with revolutionary, fighting and labor traditions in which everyone can reach a highly professional skill.

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ROBOTICS

KRASNYY PROLETARIY ROBOTS MANUFACTURING OTHER ROBOTS

Moscow GOLOS RODINY in Russian No 13, Mar 86 p 4

[Article by A. Davidyants: "Robots Making Robots"]

[Text] The Krasnyy Proletariy machine tool manufacturing plant in Moscow is one of the oldest enterprises in the country. It was founded back in 1857. Initially, it was a small repair shop, but it was then converted into a machine shop producing primitive machinery and equipment. Since 1932, Krasnyy Proletariy has been making unique machine tools which have more than once received awards at international exhibitions. It was the first plant in the world to assemble machine tools on a conveyor. Today, the enterprise exports to more than 70 countries. The first shops assembling industrial robots in the Soviet Union were put into operation here.

...You see practically no people in this huge, brightly-lit shop. Workers have been replaced by robots in both the automated billet storage area and the finished parts storage area, in the sector manufacturing these parts and on the conveyor line, where robots assemble robots. By themselves. The operator servicing the robotized zomplex pushes a button on the display and the search for the needed blanks or parts begins in the storage area. Soon, a container filled with them arrives on a special platform and a small cart, a robot-car, deives up to it. It takes the container and brings it to the operator. In exactly the same way, a robot-car takes the finished parts to the assembly sector. If two or three operations are required, powerful machining centers in the form of multipurpose machine tools are, in the direct sense, switched on. They are equipped with 30-60 different tools. Such centers mainly machine large parts from four or five sides: lapping, grinding cutting, and performing many other operations.

Less than a year has passed since the new robot production shop began operation. Thus far, not everything has gone as one would like, and understandably so, since the equipment is very complex and mastering all aspects of it is not easy. We need time to train skilled operators, repairmen, programmers, and to master the new machinery. Young people with secondary technical and higher educations work in the shop. It would, of course, be hard to bring the shop up to planned capacity right away, so we planned to produce only 2,000 robots the first year and then gradually increase that number to a maximum of 6,300 units in 1987.

A majority of the workers have come here from the older Krasnyy Proletariy shops and from ordinary metalworking machine tools. In the opinion of many people I talked with, it is much more interesting and easier working in the new shop. It is less monotonous and less fatiguing. I visited the shop at the end of the work shift, but the people looked cheerful.

The introduction of flexible manufacturing complexes has increased labor productivity several-fold. Without such complexes, it would take three times as many machine tools and four times as many people to produce this many robots.

As they leave the conveyor, the robots take up posts on 24-hour shifts and replace people in shops. But where do the people go? They go to places prepared for them in advance. At the Krasnyy Proletariy, as at other industrial enterprises here, there is no problem finding a job. But good machine tool operators are snapped up right away. Here, too, we need people both in the older shops and in the new ones opening up. The plant is continuing to expand its production space. The use of modern production methods, renovation and modernization have permitted an 80-percent increase in production volume this past year alone.

Very serious attention has been paid to robotization in the Soviet Union recently. In 1985, we intend to produce about 15,000 robots. That is nearly three times as many as were produced during the entire preceding five-year plan. Putting capacities specialized to produce industrial robots into operation provides an opportunity to increase the number of such robots nationwide to 100,000 by 1990. They will help free about 250,000 people from hazardous, difficult manual, injurious and monotonous work and will produce an annual overall economic impact of approximately 400 million rubles.

We are currently producing dozens of different industrial robot models with from two to nine degrees of freedom. The cost of introducing them is recompensed in two to 2.5 years. Each robot has an annual economic impact of 6,000 to 12,000 rubles. On line now are more-complex and more-expensive automatic machines with improved computer-based control systems. They will be used to create robotized technological complexes and, ultimately, flexible, automated manufacturing systems.

Robots are appearing which do not simply imitate human actions, but which permit performing complicated technological operations both better and faster. The list of such operations is quite long: spot and seam welding, cutting, soldering, surface finishing, paintina, electroplating. By following technological procedures closer than is possible using manual labor, product quality is improved. The robot works faster, lifts more and performs several operations simultaneously. The result is increased labor productivity.

Until recently, industrial robots were used primarily in machinebuilding. Now, their sphere of application is rapidly expanding. For example, their use in mining industry is very promising. Replacing drill operators, an automatic machine can work two to three times faster and enable many people to avoid being subjected to noise, vibration and dust. A mobile industrial robot is being developed whose basic purpose will be to prepare coal mine headings without direct human participation. Robots are being used to handle radioactive

materials, to service nuclear reactors and in underwater drilling and geological surveying, and they are making the physically difficult parts of work in transport and warehouses and in hot shops easier.

We are planning the development of the next generation of robots: self-teaching, capable of distinguishing graphic symbols, able to respond to sounds, signals and human speech.

Production mechanization and automation is not causing unemployment here, as has happened when robots have been used in capitalist countries. No workers are left without jobs after production modernization. Many undergo special retraining at state expense, after which they become skilled operators of automatic lines, with some being transferred to other production sectors where their knowledge and experience are required. Some workers move into the services sphere.

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ROBOTICS

ROBOTICS INSTITUTE ESTABLISHES TEACHING DEPARTMENT

Leningrad LENINGRADSKAYA PRAVDA in Russian 24 Apr 86 p 2

[Text] Automatic manipulators have been added to the stock of equipment of the Central Institute of Robot Technology and Technical Cybernetics.

A teaching complex which has been created here will prepare students for 'communication' with the electronic helpers, whose numbers in the industry of Leningrad will reach 15,000 units by the end of the present 5-year plan.

In the laboratories of the complex, there are pneumatic, electromechanical and hydraulic robots, controls for them, and systems of TV and ultrasonic vision. The future engineers don't just study the principles of operation of such equipment. In classes, they can also be creative -- work is done on improving components of the equipment.

In view of the shortage of personnel in this area, the teaching complex has concluded agreements with institutes for advanced training of specialists in various fields.

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ROBOTICS

INSTITUTE ADAPTS ROBOT WITH VISION SYSTEM

Moscow SOVETSKAYA ROSSIYA in Russian 13 Apr 86 p 1

[Excerpt] A system of technical vision and adaptation has been developed at the Institute of Control Problems.

I visited a laboratory of this institute, where I was shown a robot. "Where will this robot work?" I asked.

"Its workplace will be in preparatory sections of flexible production systems," answered Candidate of Technical Sciences A. A. Petrov, a senior science associate. "You have probably seen on television how a self-propelled cart moves about a shop with an assortment of parts on its tray. It stops next to a manipulator, which easily takes a part and places it in a machine tool. All very nice. But how did the parts get on this cart, and in the precise positions that they occupy? Right now, people do this, but in the near future, a 'seeing' robot will begin to do this. We worked for many years in collaboration with industrial specialists on the development of organs of sense and adaptation for robots. The organ that we came up with is a special video attachment hooked up to a microcomputer. It has turned an ordinary robot into an adaptive one."

Rigidly-programmed robots and adaptive ones belong to different classes. The advantages of their employment depend on the nature of the work, on specific production processes. Right now, production of robots which operate according to a rigid program is rather widespread, whereas adaptive robots still are found only in laboratories.

Robots that possess artificial vision and which adapt quickly to changing working conditions are needed greatly in industry. Therefore there should be no delay in introducing them. According to specialists' forecasts, robots 'with eyes' will account for more than one-fourth of all industrial robots in the world by 1990.

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ROBOTICS

DEVELOPMENT OF TUR-10 ROBOT WITH VISION

Moscow KOMSOMOLSKAYA PRAVDA in Russian 3 Nov 85 p 1

[Abstract] The article gives an account of work on the development of a multipurpose industrial robot, the TUR-10, which was recently awarded a Communist Youth League prize.

It is recalled that this project began at the "Tekhnopribor" (technical instrument) Research and Production Association in Smolensk, in line with a decision of the Ministry of Instrument Building, Means of Automation and Control Systems. One of the robot's developers, a "Tekhnopribor" associate named Bolotin, had been in contact with the robotic systems laboratory of the Institute of Machine Science imeni Blagonravov in Moscow. This laboratory was headed by Andrey Ivanovich Korendyasev. Among the other "Tekhnopribor" associates who took part in the project were S. Momotyuk, A. Fedosenkov, A. Shermakov and A. Shukshin.

Personnel of the Institute of Control Problems are credited with the development of an artificial-vision and adaptation system with which the TUR-10 is equipped. This system enables the robot to work with non-oriented objects and independently to select the parts it needs from a group in different positions. Vladimir Tulepbayev and Sergey Kuz'min are identified as two of the system's principal developers. They worked under the direction of A. Petrov. The TUR-10 was introduced into production at the "Tekhnopribor" plant in Mogilev.

(A photograph is given showing Kuz'min and Tulepbayev operating a robot which bears the model number TUR-10K.)

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ROBOTICS

ROBOTS FOR HELICOPTER-ENGINE TESTING NEEDED

Moscow VOZDUSHNYY TRANSPORT in Russian 17 Apr 86 p 2

[Abstract] The author reports on the retooling and automation of testing facilities at civil aviation's Plant No. 404.

Particular attention is devoted to progress in introducing an original computerized system for the control of helicopter-engine testing processes in the engine testing station of the plant's Shop No. 4. This station is headed by V. Pitirimov. The author relates that work on designing and organizing this system, which is called "Astra", was undertaken by specialists of the shop and the plant's data-processing center. Associates of the Sverdlovsk Planning-and-Design Bureau of Automated Control Systems, the Central Scientific Research Institute of Automated Management and Control Systems for Civil Aviation, and the Riga Institute of Civil Aviation Engineers reportedly are taking part in the further improvement of this system. In particular, a remote-control system is under development which would allow main parameters of engines to be corrected directly by commands from a computer, while the engines are running. Microrobots that can be installed directly on engine parts have been developed to serve as actuating mechanisms. Testing of these robots, which have been recognized as inventions, was completed in 1983. Although the plant's engine testing station and aggregate shop will require hundreds of the microrobots, only a small number of them can be produced in laboratory conditions, and mass production of the mechanisms has not been organized.

The author reports that this development has been approved by Ye. Kitov, head of the all-Union production association "Aviaremont" (aircraft repair), and Yu. Bol'shakov, head of this association's department of automation equipment and production development. The author calls upon "Aviaremont" for more vigorous assistance in publicizing the robots and putting them into production at plants which specialize in nonstandard equipment.

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